

MITES OF THE GENUS *MACROCHELES* LATR.
(MESOSTIGMATA)
ASSOCIATED WITH COPRID BEETLES IN THE COLLECTIONS
OF THE BRITISH MUSEUM (NATURAL HISTORY)

BY

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INTRODUCTION

FEMALES of the coprophilous species of *Macrocheles* are facultatively parthenogenetic (arrhenotokous) and display a phoretic association with insects, particularly coprid beetles. The genus is world wide in distribution and, at present, contains a greater number of species than any other in the Mesostigmata. The majority of the known species have been described by Berlese (1903, 1910, 1918) but, unfortunately, the inadequacy of the descriptions, which are rarely accompanied by illustrations, has made the identification of many of the species so difficult that Berlese's basic work has acted more as a deterrent than a stimulant to subsequent taxonomic studies.

The forty-six species dealt with in the present work have been collected from coprid beetles in the collections of the Department of Entomology, British Museum (Natural History). The mites were relaxed in 60% lactic acid before study. Type material is deposited in the British Museum (Natural History).

CLASSIFICATION

The genus *Macrocheles* contains the majority of the described species of the family Macrochelidae. Attempts at a division of the genus into more workable units have not altogether been successful owing to the high degree of morphological homogeneity displayed by its members. Evans & Browning (1956) and Evans (1956) were unable to find reliable criteria for distinguishing *Coprholaspis* Berl., *Nothrholaspis* Berl., *Holocelaeno* Berl., *Dissoloncha* Falconer, *Monoplites* Hull and *Neholaspis* Turk, from *Macrocheles*, although, recently, Filipponi & Pegazzano (1960) have proposed the genus *Glyptholaspis* to accommodate four species originally ascribed to *Macrocheles*, and Krantz (1962) has given generic status to *Holocelaeno*. The genus *Glyptholaspis*

is characterized by the degree of sclerotization of the idiosoma and the sculpturing of the dorsal and sternal shields. Species of *Holoclaeno* differ from those of *Macrocheles* in the form of the cheliceral brush. Before considering the classification of the insecticolous members of the genus *Macrocheles* it seems appropriate to review the morphological criteria at present used in the classification of females of the group.

The chelicerae of the species associated with Coleoptera show a remarkable constancy in digital dentition, probably the result of adaptation for grasping stiff bristles in the region of the mouthparts of the insect. The digits are relatively short and stout, and the most characteristic feature of the dentition is the presence of a large backwardly directed tooth on the fixed digit and a stout bicuspid tooth on the movable digit (Text-fig. 9). The bicuspid tooth opposes a deep cleft behind the large tooth on the fixed digit. The insectan bristle lies in the cleft on the fixed digit and is held firmly by the bicuspid tooth. In free-living members of the genus the digits are usually longer and thinner and their dentition is more variable. The characteristic gripping mechanism of the insecticolous forms is poorly developed or lacking. A *pilus dentilis*, a dorsal seta, and two lyriform fissures are always present. The arthrodial membrane at the base of the movable digit is produced into one or two brush-like processes (Text-fig. 9). One "brush" is invariably strongly developed and in the *Holoclaeno*-group its filaments are extremely long, surpassing the tip of the digit (Text-fig. 136). The form of the gnathosomal base, hypostome and pedipalps, shows little interspecific variation. The corniculi are horn-like and subparallel and there are five or six, rarely seven, transverse rows of deutosternal denticles. Each pedipalp has five free segments, excluding a three-tined seta-like apotele, and the ontogenetic development of its chaetotaxy is normal; the adult complement being 2-5-6-14-15. The tectum is basically tripartite (Text-fig. 69) except in *Macrocheles superbus* Hull which has a unipartite tectum.

The development of the sclerotization and chaetotaxy of the dorsum of the idiosoma during ontogeny is relatively constant. There appear to be no distinct sclerotized areas in the larva, but the podosomal region bears the normal nine pairs of setae, and the opisthosomatal region five pairs. A large podonotal shield is present in the protonymph and carries 11 setae. The opisthonotal shield is also relatively large and bears eight or nine pairs of setae, comprising two or three pairs in the J-series, three pairs in the Z-series, and three pairs in the S-series. The deutonymphal dorsal shield is incised laterally at the juncture of the podonotal and opisthonotal elements. The region anterior to the incisions is provided with 18 pairs of setae and the posterior region, 10 or 11 pairs, depending on the presence of two or three setae of the J-series. Complete fusion of the podonotal and opisthonotal shields occurs in the adult which retains the deutonymphal chaetotaxy. We have adopted the system used by Hirschmann (1957) for the nomenclature of the dorsal setae (Text-fig. 1). There is a wide range of setal forms. The majority of the species have simple or finely pilose setae, but coarsely serrated and plumose dorsal setae may occur. The verticals (ix) and Z5 often differ in form from each other and from other dorsal setae. The dorsal shield is usually provided with 22 pairs of pore-like structures, and its surface may be smooth, punctate, areolate, or reticulate.

The tritosternum is biramous, the base being longer than wide and the laciniae pilose. There is considerable variation in the size and ornamentation of the sternal shield which bears the normal three pairs of setae. In the forms associated with Coleoptera and other insects the sternal shield extends to the level of the middle of coxae III. Its posterior margin and, more rarely, its anterior margin, may be deeply incised to give the sternal shield a strip-like appearance as in *M. spectandus*. The shield is more heavily sclerotized in free-living members of the complex. In the *Glypholaspis*-group it is fused postero-laterally with the endopodal elements and extends to the level of the posterior margin of coxae III. The surface of the sternal

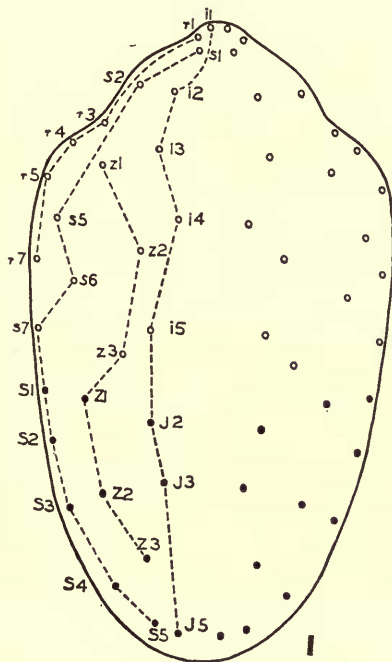


FIG. 1. Nomenclature for the chaetotaxy of the dorsal shield in the adults of *Macrocheles* Latr.

shield may be smooth, punctate, areolate, or reticulate. Many insecticolous species have well-defined structural lines, the most important of which are the *linea media transversa* connecting the bases of sternal setae II and the *linea arcuata*. Berlese (1918) used the ornamentation of the sternal shield as the criterion for subdividing his subgenus *Coprholaspis* into phalanges, but this system has not been generally adopted owing to the difficulty of characterizing the ornamentation.

The genital shield has a pair of setae and is always provided with accessory sclerites. Its posterior margin is usually truncate. All species have a ventri-anal shield bearing from one to three pairs of pre-anal setae in addition to the three setae normally associated with the anal opening. There are no euanal setae. Neotrichy of the unsclerotized integument of the venter of the opisthosoma is not uncommon.

The peritrematal shield is free posteriorly and the peritreme forms a U-shaped loop on leaving the large stigma.

The legs are six segmented, excluding the ambulacrum. Lyriform fissures occur in the femora and tarsi of all legs, and those on the femora and the proximal part of the tarsi form false divisions of the segments. Legs I lack ambulacra but those on legs II–IV each comprises a lobate pulvillus and two claws. The lateral processes of the ambulacra show considerable variation in length, and may be simple or divided distally. They tend to be longer in the free-living species than in the insecticolous forms. The chaetotaxy of the legs of the Mesostigmata has been largely ignored by acarologists, although preliminary studies by one of us (G. O. E.) indicate that the number of setae per segment, their form, and distribution are of taxonomic importance. The number of setae on various segments of the legs of species of *Macrocheles* is extremely constant (Text-fig. 2a–d); the only segment showing interspecific variation is the genu of leg IV. This segment may have six or seven setae (Text-fig. 2d and e). There appears to be no definite correlation between the number of setae in the J-series (two or three) and the chaetotaxy of femur IV; although species of the *Holoclaeno*-group which we have examined have three setae in the J-series and seven setae on femur IV. The leg setae show considerable variety in form. Those on tarsus II tend to become thickened and spine-like (Text-fig. 10). The number of setae on the various segments of the legs (excluding tarsus I) is given in the following table (Table I).

TABLE I.—Numbers of Setae on the Leg Segments of *Macrocheles* Latr.

Leg	Coxa	Trochanter	Femur	Genu	Tibia	Tarsus
I . . .	2	5	13	11	12	—
II . . .	2	5	11	11	10	18
III . . .	2	5	6	7	7	18
IV . . .	1	5	6	6/7	7	18

The nomenclature for the setae on genu IV is given in Text-fig. 2e.

The variety of morphological characters exhibited by the insecticolous *Macrocheles* suggests the possibility of their division into supraspecific groups. Of the characters we have considered, the following three appear to be the most promising since they are readily definable and are subject to little or no intraspecific variation:

- a. The number of setae in the J-series on the dorsal shield;
- b. The number of setae on genu IV;
- c. The form and length of the brush-like process of the arthroal membrane at the base of the movable digit of the chelicera.

The relationships between the groupings obtained by using these characters singly or in combination seem to be intra- rather than intergeneric. In view of this we have considered it inadvisable at present to propose new taxa. We have, however, given these units the status of species-groups. Until a comprehensive study can be undertaken on the external morphology of the family as a whole, the weighting of the characters we have used must, of necessity, be arbitrary. The emphasis on the importance of the chaetotaxy of the dorsal shield in the definition of the species groups has practicability and not phylogeny as its basis. The forty-six species

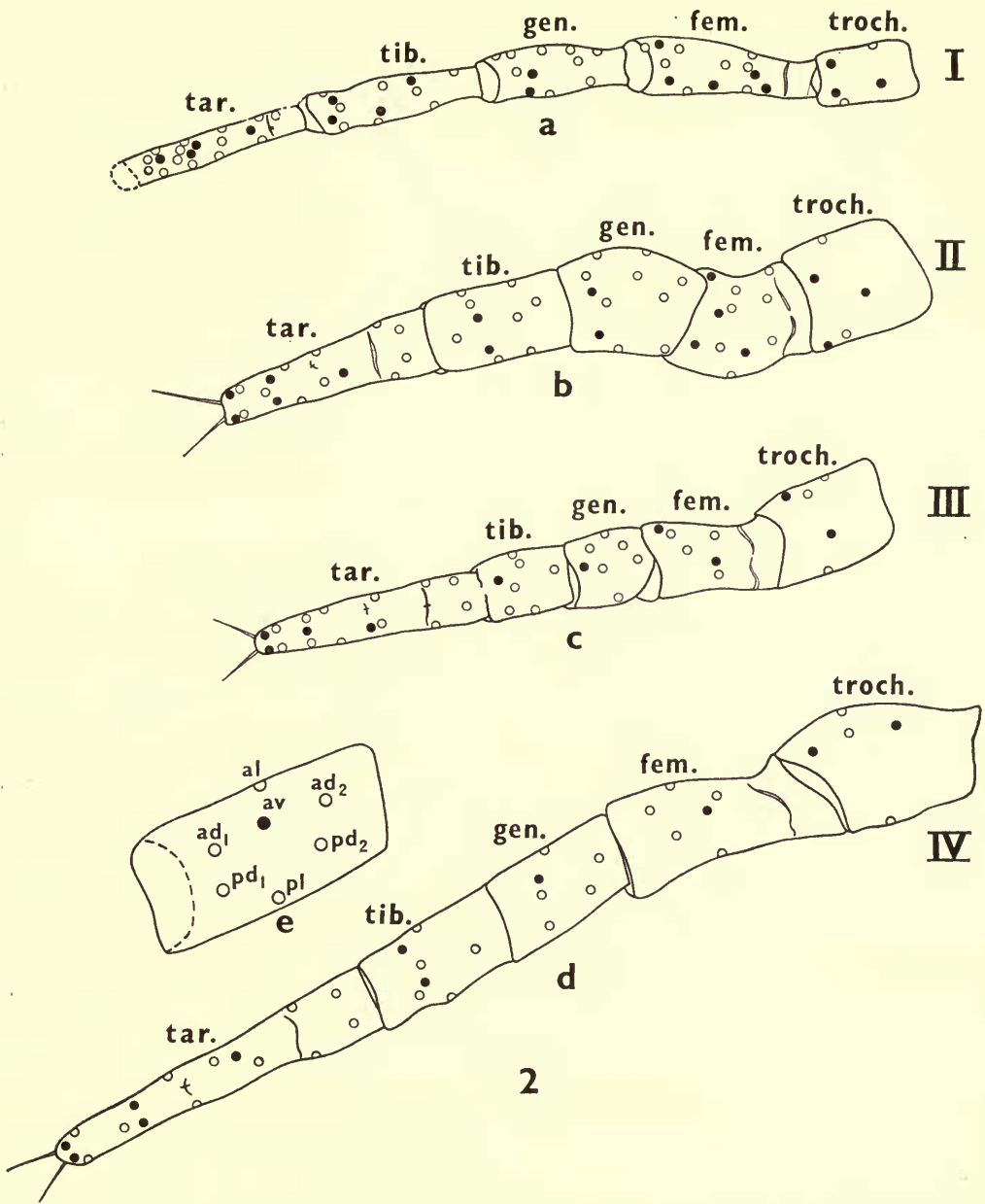


FIG. 2a-d. The distribution of setae on legs I-IV of adult *Macrocheles* Latr. excluding the coxae. e, nomenclature for the setae on genu IV. The black dots denote the positions of setae occurring ventrally on the segments. ad₁, ad₂, antero-dorsal setae; al, antero-lateral seta; av, antero-ventral seta; fem., femur; gen., genu; pd₁, pd₂, postero-dorsal setae; pl, postero-lateral seta; tar., tarsus; tib., tibia; troch., trochanter.

considered in this work may be separated into the following distinct groups :

- a. Cheliceral "brush" long, filamentous and extending up to or beyond the distal end of the movable digit of the chelicera (Text-fig. 136) ; dorsal shield with 29 pairs of setae¹ (Text-fig. 134) ; genu IV with seven setae *mitis*-group (p. 378)
- Cheliceral "brush" shorter, its processes never filamentous, rarely extending to the distal end of the movable digit (Text-fig. 5) ; dorsal shield with 28 or 29 pairs of setae ; genu IV with six or seven pairs of setae b
- b. Dorsal shield with 28 pairs of setae, J₂ absent (Text-fig. 3) . *glaber*-group² (p. 332)
- Dorsal shield with 29 pairs of setae, J₂ present (Text-fig. 171) *bregetovae*-group (p. 389)

GLABER-group

Macrocheles abbreviatus Berlese, 1918

Macrocheles (Coprholaspis) abbreviatus Berlese, A., 1918, *Redia* 13 : 151.

FEMALE. Dorsal shield (890 μ long \times 529 μ wide) finely granular, reticulated, with a procurved transverse line medially, and bearing 28 pairs of setae (Text-fig. 3). The verticals, ix, are two diameters apart and slightly pilose distally ; setae r₄, r₅, z₁, i₃ and J₅ are also pilose, remainder simple.

Sternal shield granular, with conspicuous undulating transverse lines in its anterior third. *L.m.t.* undulating, *l.o.p.* conspicuous (Text-fig. 4). Genital shield truncated posteriorly, granular, and with punctate ornamentation. Ventri-anal shield (289 μ long \times 258 μ wide) granular and with recurved transverse lines. The nine setae are simple.

The chelicera is shown in Text-fig. 5. The brush-like process of the synarthrodial membrane is half the length of the movable digit. Six rows of deutosternal teeth.

Genu IV with six stout simple setae. Tarsus II (Text-fig. 6) 187 μ , tibia II 106 μ .

MALE. Unknown.

DISTRIBUTION. Berlese (1918) recorded this species from *Atheucus* sp. in Italian Somaliland. The Museum collections contain five females on *Scarabaeus prodigiosus* Erichs., collected by W. E. Cutler (1924-283) at Dar-es-Salaam, Tanganyika ; and over a dozen females from a "coprid beetle", Commonwealth Institute of Entomology No. 7766, from N. Bujishu, Uganda.

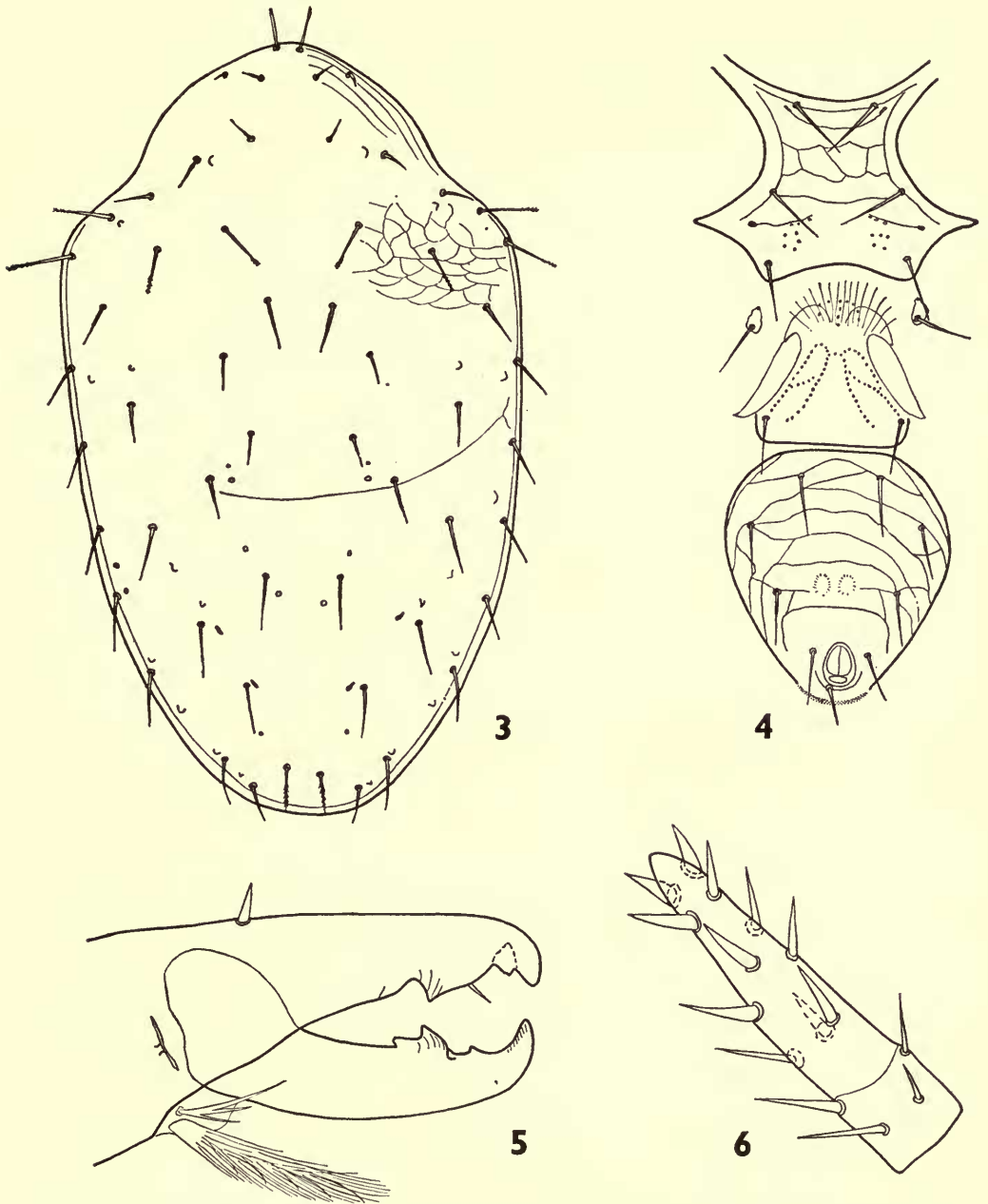
Macrocheles argentinus sp. nov.

FEMALE. Dorsal shield (580 μ long \times 330 μ wide) finely granular, entirely reticulated, and bearing 28 pairs of setae (Text-fig. 7). The verticals, ix, are thorn-like and project anteriorly, whilst J₅ are short and serrated. The remaining setae are simple.

Sternal shield granular with some punctate ornamentation. *L.m.t.* undulating, incomplete medially ; *l.arc.* recurved, discontinuous ; *l.o.p.* not reaching to *l.m.t.* (Text-fig. 8). Genital shield granular, truncated posteriorly and with a strongly recurved punctate line connecting the setal bases. Ventri-anal shield (178 μ long \times 164 μ wide) granular with only faint traces of reticulation. The nine setae are simple.

¹ Krantz (1962) states that the genus *Holocelaeno* has 28 pairs of setae on the dorsal shield. All the species of this group we have examined have 29 pairs.

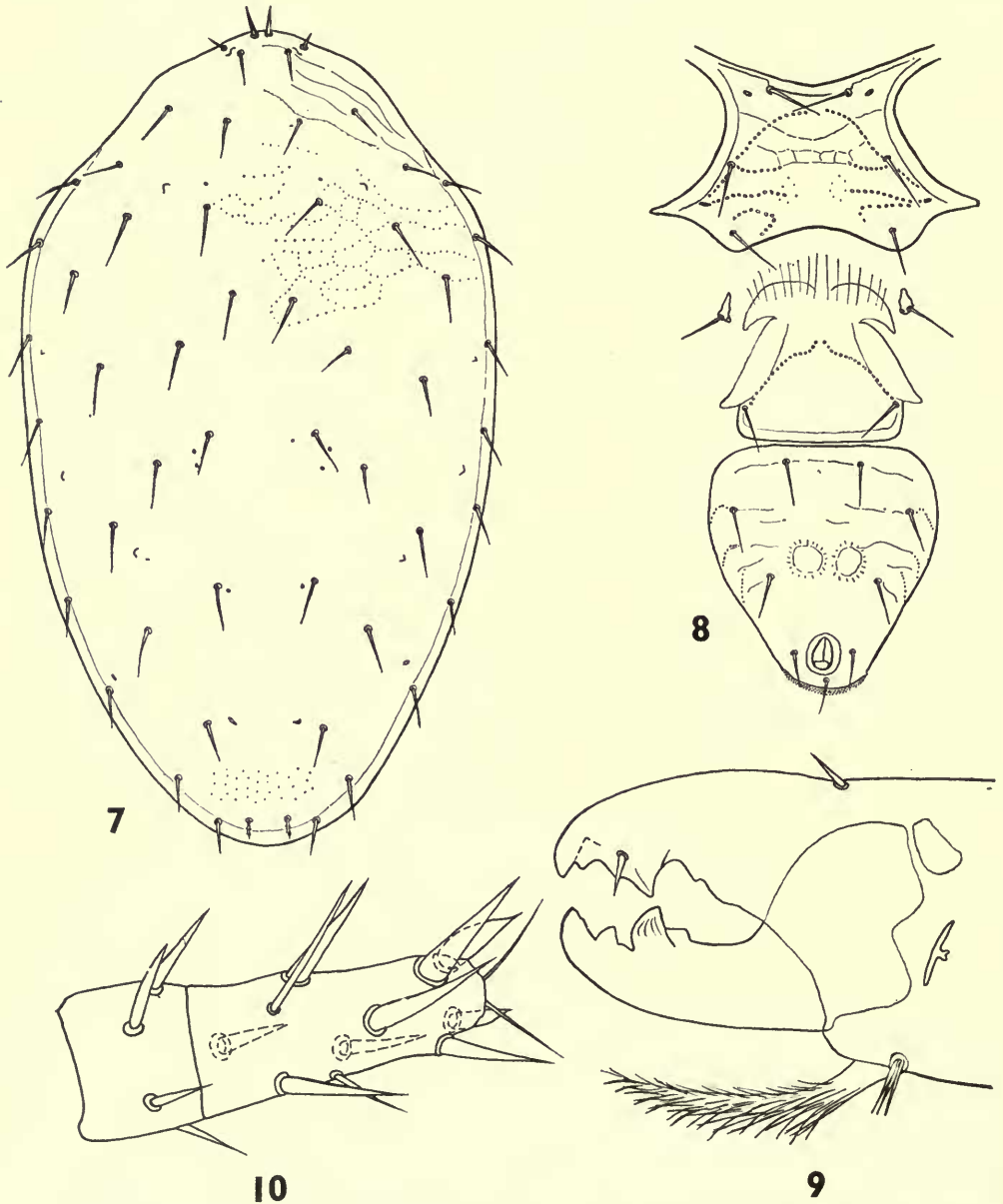
² We have not considered the *Macrocheles glaber*-complex in this work since intensive laboratory studies on this "species" are being undertaken by Dr. Filipponi and Dr. Pegazzano.



FIGS. 3-6. *Macrocheles abbreviatus* Berlese, female. Fig. 3, dorsal shield. Fig. 4, ventral shields. Fig. 5, chelicera. Fig. 6, tarsus II.

The chelicera is shown in Text-fig. 9. The brush-like process of the synarthrodial membrane is three-quarters the length of the movable digit. Six rows of deutosternal teeth.

Genu IV with six stout simple setae. Tarsus II 101μ (Text-fig. 10), tibia II 73μ .
 MALE. Unknown.



FIGS. 7-10. *Macrocheles argentinus* sp. nov., female. Fig. 7, dorsal shield. Fig. 8, ventral shields. Fig. 9, chelicera. Fig. 10, tarsus II.

LOCALITIES. The holotype female (1961.7.14.264) and ten paratypes (1961.7.14.265-274) on *Eudinopus dytiscoides* Schreiber, collected by G. E. Bryant (1919-147) at Villa Valeria, Argentina; and one paratype (1961.7.14.275) from the same species of beetle in the Nevinson collection (1918-14) labelled "S. America".

***Macrocheles bacchusi* sp. nov.**

FEMALE. Dorsal shield (722 μ long \times 415 μ wide) with ornamentation consisting of fine dotted reticulations and bearing 28 pairs of setae (Text-fig. 11). The majority of the dorsal setae are finely pilose distally, but setae 11, 15, 55, J3 and Z3 are simple. The verticals, 11, are almost two diameters of their bases apart.

Sternal shield granular with symmetrical punctate ornamentation. *Liniae* concealed in the ornamentation (Text-fig. 12). Genital shield granular, truncated posteriorly, and with punctate ornamentation. Ventri-anal shield (237 μ long \times 206 μ wide) pear-shaped in the figured specimen (the holotype), but variable in outline, granular, and with transverse punctate lines. The nine ventri-anal setae are simple.

The chelicera is shown in Text-fig. 13. The synarthrodial brush of setae is half the length of the movable digit. Six rows of deutosternal teeth.

Genu IV with six stout setae all of which are pilose, or bipectinate, distally. Tarsus II (Text-fig. 14) 152 μ , tibia II 86 μ .

MALE. Unknown.

LOCALITIES. The holotype female (1961.7.14.276) and three paratypes (1961.7.14.277-279) on *Circellium bacchus* Fabr., collected by Burchell (1110b) in "Africa"; and one paratype (1961.7.14.280) on *Macroderes greeni* Kirby, collected by R. E. Turner (1928-421) at Worcester, Cape of Good Hope.

***Macrocheles baramensis* sp. nov.**

FEMALE. Dorsal shield (825 μ long \times 540 μ wide) granular, covered by fine reticulations and bearing 28 pairs of setae (Text-fig. 15). The vertical setae, 11, have their bases touching and are pilose in their distal halves. Setae 14, 15, 22, 23 and J3 are simple, all other dorsal setae are finely bipectinate in their distal halves.

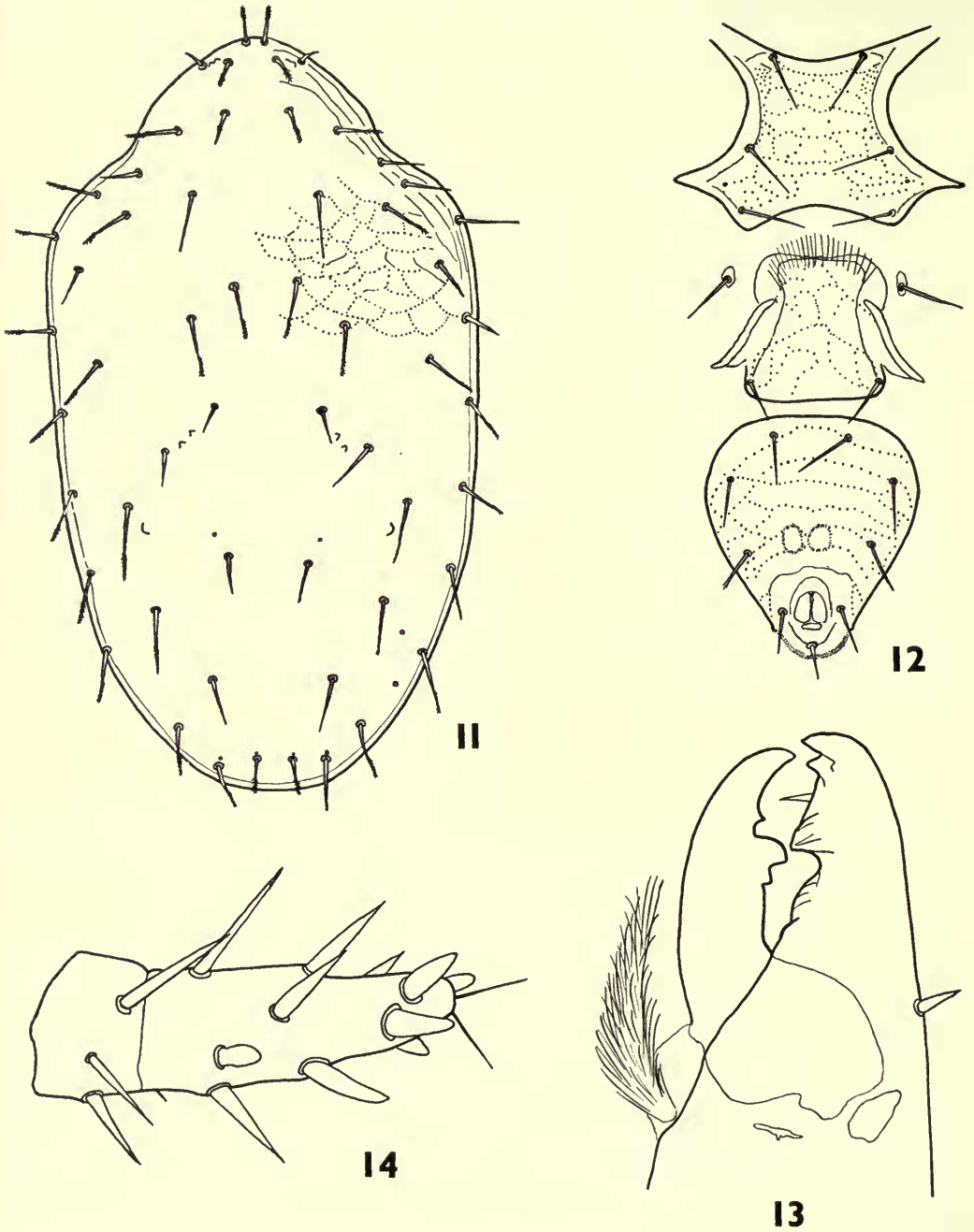
Sternal shield granular, with faint traces of linear ornamentation. *L.m.t.* undulating, slightly procurved, *l.arc.* incomplete, *l.o.p.* conspicuous (Text-fig. 16). Genital shield granular. Ventri-anal shield (280 μ long \times 205 μ wide) with conspicuous transverse lines; all setae simple except for the finely-pilose post-anal.

The chelicera is shown in Text-fig. 17. The brush-like process of the synarthrodial membrane is two-thirds the length of the movable digit. Six rows of deutosternal teeth.

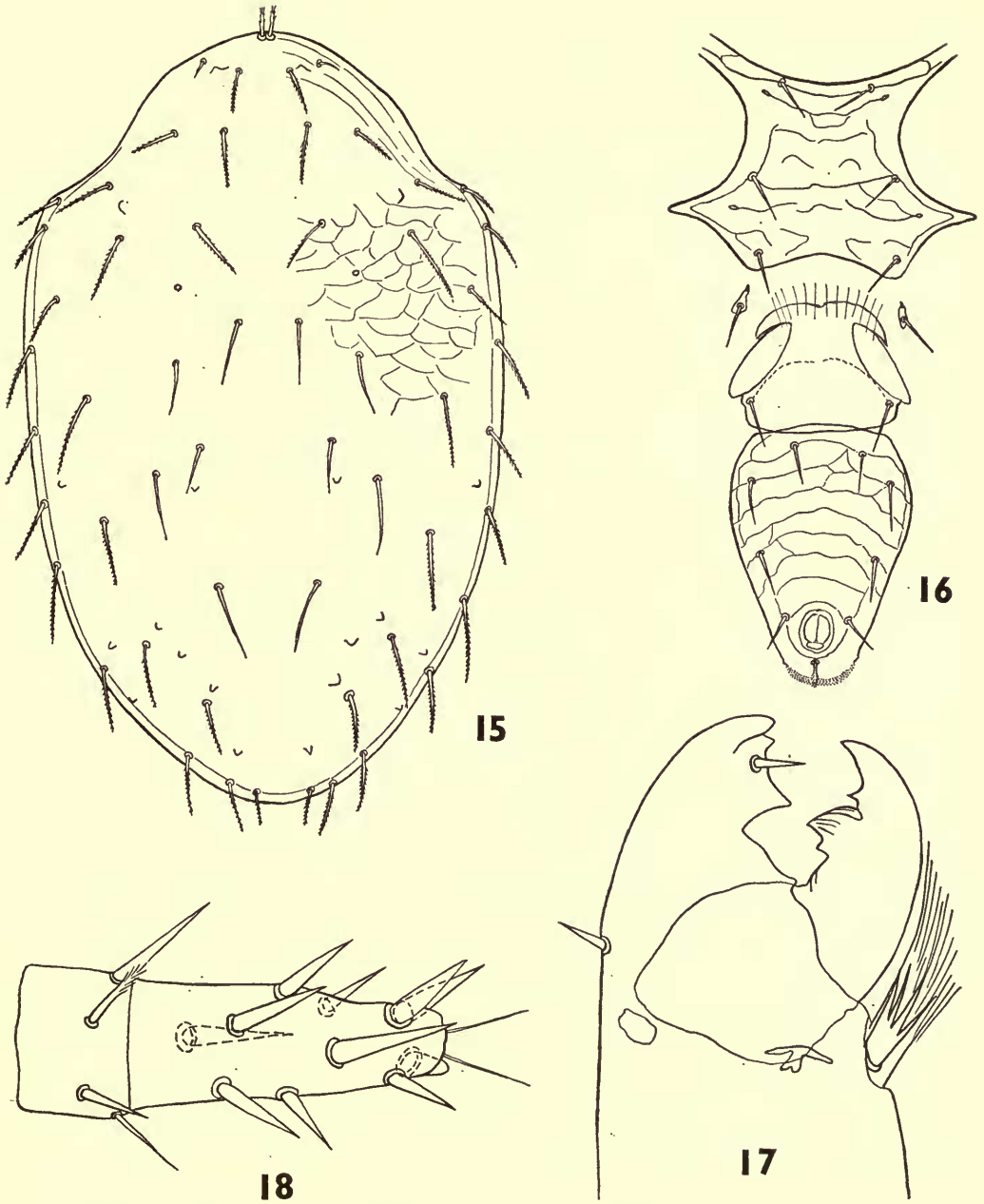
Genu IV with six stout setae all of which are strongly pilose. Tarsus II (Text-fig. 18) 194 μ , tibia II 126 μ .

MALE. Unknown.

LOCALITY. The holotype female (1961.7.14.251) and three paratypes (1961.7.14.252-254) on *Gymnopleurus maurus* Sharp, collected by A. Everett (1892-8) at Baram, NW. Borneo.



FIGS. 11-14. *Macrocheles bacchusi* sp. nov., female. Fig. 11, dorsal shield. Fig. 12, ventral shields. Fig. 13, chelicera. Fig. 14, tarsus II.



FIGS. 15-18. *Macrocheles baramensis* sp. nov., female. Fig. 15, dorsal shield. Fig. 16, ventral shields. Fig. 17, chelicera. Fig. 18, tarsus II.

Macrocheles boxi sp. nov.

FEMALE. Dorsal shield (560μ long \times 340μ wide) finely granular and with faint reticulations, and bearing 28 pairs of setae (Text-fig. 19). All setae are simple with the exception of J5 which are finely serrated. The thorn-like verticals are about one diameter apart.

Sternal shield granular. *L.m.t.* slightly procurved, *l.arc.* recurved, discontinuous anteriorly, *l.o.p.* extending almost to the centre of the sternal shield (Text-fig. 20). Genital shield small, granular, and truncated posteriorly. Ventri-anal shield (165μ long \times 145μ wide) finely granular, with faint transverse lines and nine simple setae.

The chelicera is shown in Text-fig. 21. The brush of setae on the synarthrodial membrane is about half the length of the movable digit. Six rows of deutosternal teeth.

Genu IV with six simple setae. Chaetotaxy of legs simple. Tarsus II 104μ (Text-fig. 22), tibia II 75μ .

MALE. Unknown.

LOCALITY. The holotype female (1916.7.14.56) and one paratype (1961.7.14.57) on *Canthon principalis* Burm. collected by H. E. Box (1930-238) at Tucuman, Argentina.

Macrocheles browningi sp. nov.

FEMALE. Dorsal shield ($1,040\mu$ long \times 640μ wide) with a very characteristic pattern of punctations and reticulations, and with a procurved transverse line medially, and bearing 28 pairs of dorsal setae (Text-fig. 23). The vertical setae, 11, are broad and elliptical with finely pectinate edges. Setae 13, 14, 15, 21, 22, 23, 55, 56, J3, Z1, Z2 and Z3 are simple, the remaining setae are finely pilose.

Sternal shield large, very characteristically ornamented with areolations and lines. *L.m.t.* undulating, *l.arc.* strongly recurved, discontinuous anteriorly, *l.ang.* and *l.o.p.* formed by the ornamentation (Text-fig. 24). Genital shield broad, truncated posteriorly and with a symmetrical punctate design. Ventri-anal shield (340μ long \times 435μ wide) truncated anteriorly, ornamented with transverse areolate lines and strongly-punctate areas posterolaterally. The post-anal seta is finely pilose, the remaining eight are simple.

The chelicera is shown in Text-fig. 25. The synarthrodial brush of setae is about half the length of the movable digit. Six rows of deutosternal teeth.

Genu IV with six stout pilose setae. Tarsus II 205μ (Text-fig. 26), tibia II 120μ .

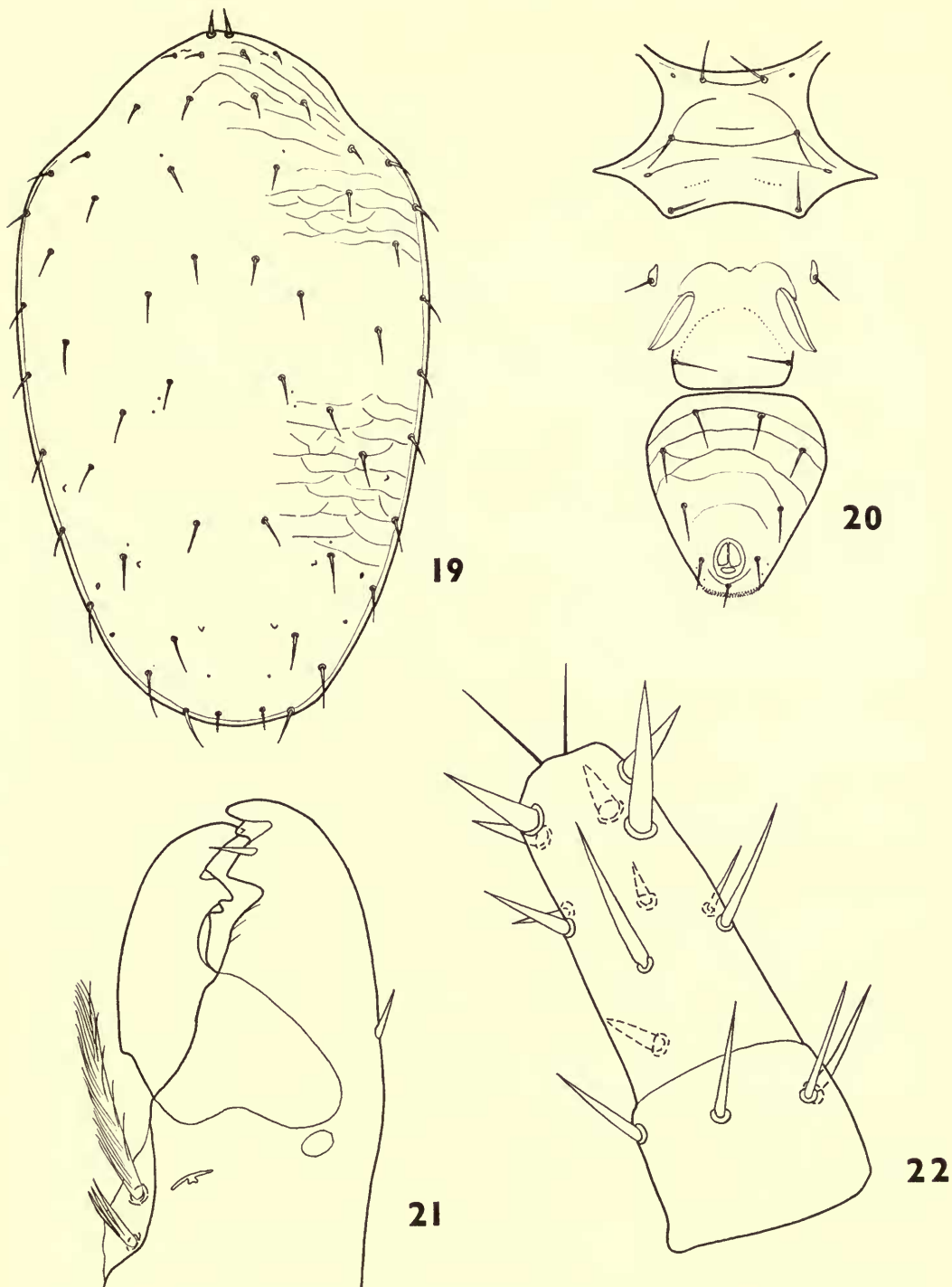
MALE. Unknown.

LOCALITY. A single female (1961.7.14.147) on *Eurysternus deplanatus* Germar in the Fry collection (1905-100), from Rio de Janeiro, Brazil.

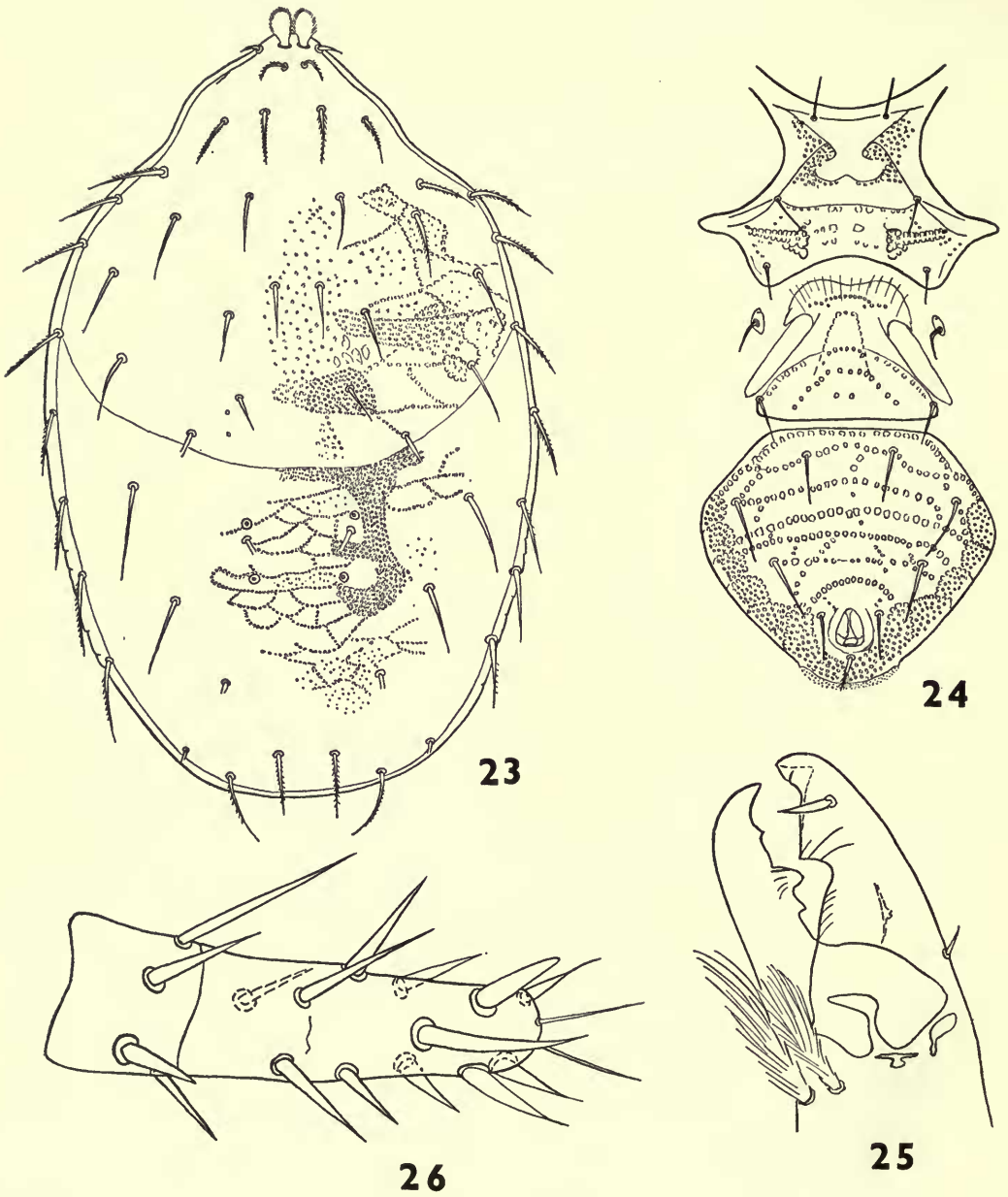
This species is named after Mr. E. Browning.

Macrocheles bryanti sp. nov.

FEMALE. Dorsal shield (930μ long \times 515μ wide) with a fine punctate ornamentation and bearing 28 pairs of setae (Text-fig. 27). The verticals, 11, are flat and



FIGS. 19-22. *Macrocheles boxi* sp. nov., female. Fig. 19, dorsal shield. Fig. 20, ventral shields. Fig. 21, chelicera. Fig. 22, tarsus II.



FIGS. 23-26. *Macrocheles browningi* sp. nov., female. Fig. 23, dorsal shield. Fig. 24, ventral shields. Fig. 25, chelicera. Fig. 26, tarsus II.

elliptical with strongly dentate margins; r1 are the shortest setae, and all are finely bipectinate. J₂ absent.

Sternal shield with punctate areas and little or no reticulation. Structural lines inconspicuous and rudimentary, represented mainly by the limits of the porose areas (Text-fig. 28). Genital shield very shallow, broad, truncated posteriorly and with little ornamentation. Ventri-anal shield (310 μ long \times 260 μ wide) with punctate transverse lines and a porose area on each side of the anus. The nine setae are simple.

The chelicera is shown in Text-fig. 29. The brush of setae on the synarthrodial membrane is short. Six rows of deutosternal teeth.

Genu IV with seven pilose setae. Tarsus II 205 μ (Text-fig. 30), tibia II 145 μ .

MALE. Unknown.

LOCALITY. The holotype female (1961.7.14.125) and two paratypes (1961.7.14.126-127) on *Eurysternus calligrammus* Dalm. collected by G. E. Bryant (1919-147) near Santos, Iha Santo Amaro, Brazil.

Macrocheles carteri sp. nov.

FEMALE. Dorsal shield (670 μ long \times 400 μ wide) with fine reticulations covering the entire surface, and bearing 28 pairs of setae (Text-fig. 31). The verticles, ix, are very finely pilose distally and their bases are almost contiguous. The remaining setae are simple.

Sternal shield granular with punctate ornamentation. *Liniae* not discernible (Text-fig. 32). Genital shield short, granular, truncated posteriorly and with punctate ornamentation. Ventri-anal shield (225 μ long \times 195 μ wide) finely granular and with punctate transverse lines.

The chelicera is shown in Text-fig. 33. The brush of setae on the synarthrodial membrane is over half the length of the movable digit. Six rows of deutosternal teeth.

Genu IV with six stout setae of which *av* is palmate distally and the remainder are simple. Tarsus II 139 μ (Text-fig. 34), tibia II 88 μ .

MALE. Unknown.

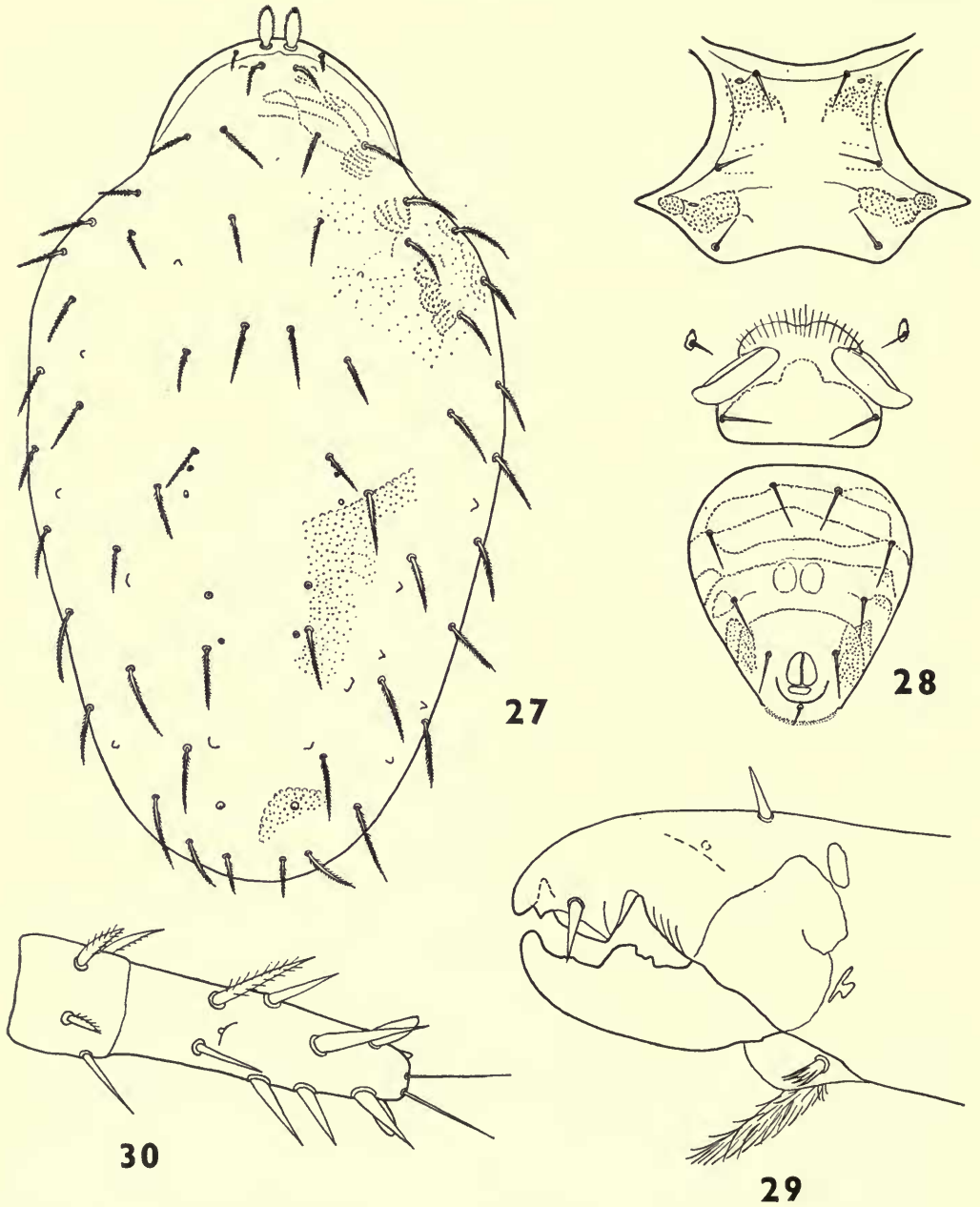
LOCALITY. A single female (1961.7.14.55) on *Phanaeus imperator* Chev. collected by G. S. Carter (1928-50) at Nanahua in the Paraguayan Chaco.

Macrocheles ceylonicus sp. nov.

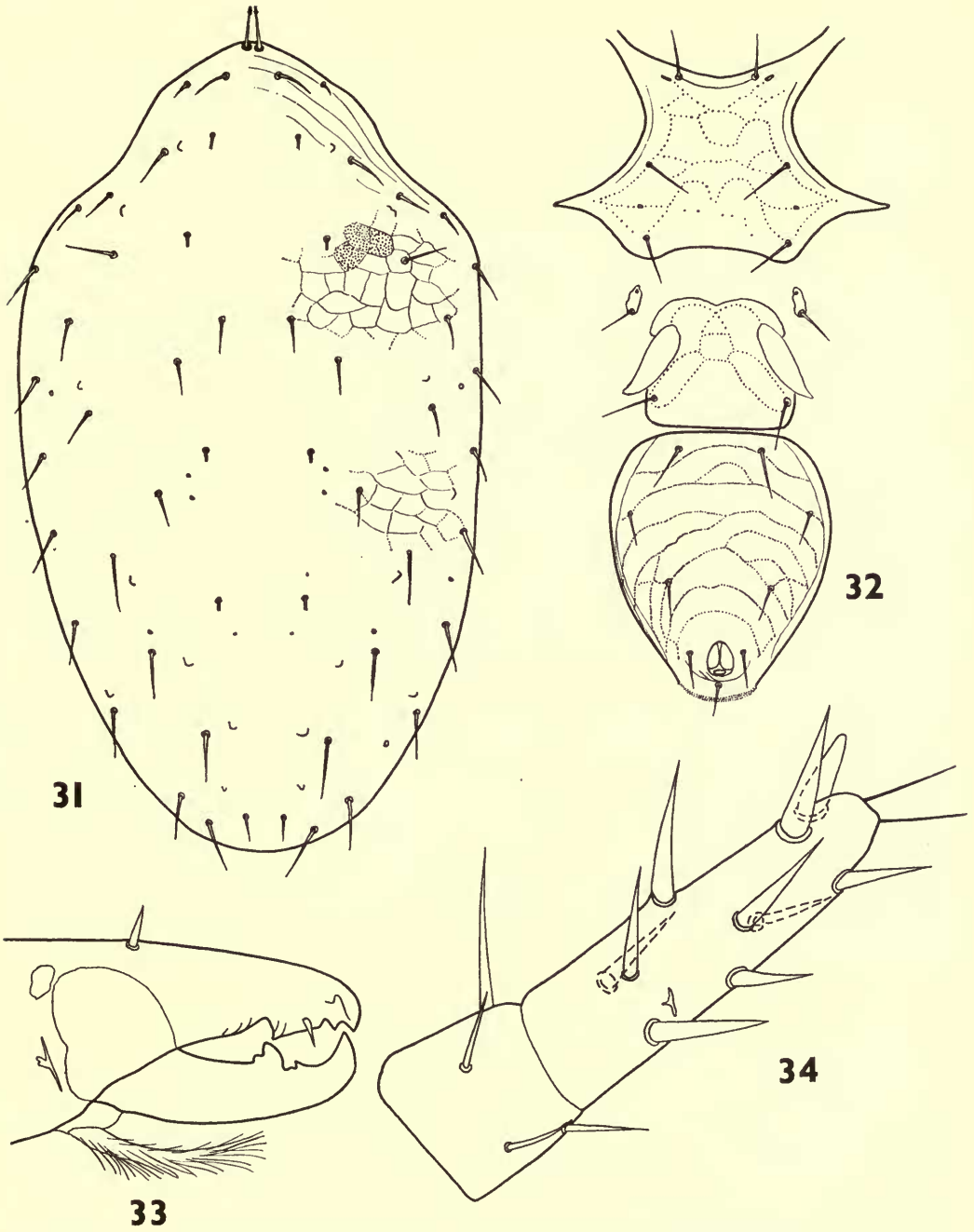
FEMALE. Dorsal shield (726-803 μ long \times 429-473 μ wide) finely granular, covered with a dotted reticulated pattern and bearing 28 pairs of setae (Text-fig. 35). Vertical setae, ix, and also r4, z1, s5 and J5 slightly pilose, remainder simple.

Sternal shield very characteristically ornamented with small elongate depressions following to a certain degree the *liniae*. *L.m.t.* undulating, *l.arc.* strongly recurved (Text-fig. 36). Genital shield granular, with punctate lines. Ventri-anal shield (231-264 μ long \times 182-198 μ wide) with ornamentation of transverse intersecting lines of depressions. The nine ventri-anal setae are simple.

The chelicera is shown in Text-fig. 37. The brush-like process of the synarthrodial membrane is half the length of the movable digit. Six rows of deutosternal teeth.



FIGS. 27-30. *Macrocheles bryanti* sp. nov., female. Fig. 27, dorsal shield. Fig. 28, ventral shields. Fig. 29, chelicera. Fig. 30, tarsus II.



FIGS. 31-34. *Macrocheles carteri* sp. nov., female. Fig. 31, dorsal shield. Fig. 32, ventral shields. Fig. 33, chelicera. Fig. 34, tarsus II.

Genu IV with six setae all of which are simple. Tarsus II 164μ (Text-fig. 38), tibia II 113μ .

MALE. Unknown.

LOCALITIES. The holotype female (1961.7.14.536) and two paratypes (1961.7.14.537-538) on *Scarabaeus erichsoni* Harold, collected by J. J. Walker (1890-80) at Colombo, Ceylon; and six paratypes (1961.7.14.539-544) also on *Scarabaeus erichsoni* in the Vigors collection (1859-57) from Madras, India.

Macrocheles cognatus Berlese, 1918

Macrocheles (Coprholaspis) cognatus Berlese, A., 1918, *Redia* 13 : 159.

FEMALE. Dorsal shield (630μ long \times 340μ wide) granular, with faint reticulations and bearing 28 pairs of setae (Text-fig. 39). With the exception of J5, which are finely bipectinate, all setae are simple. Verticals, 11, contiguous and thorn-like. A faint procurved line extends across the dorsal shield medially.

Sternal shield with conspicuous punctate ornamentation. *L.m.t.* slightly undulating, *l.arc.* strongly recurved, discontinuous anteriorly, *l.o.p.* extending across the shield and almost parallel to *l.m.t.* (Text-fig. 40). Genital shield granular, truncated posteriorly. Ventri-anal shield (175μ long \times 165μ wide) ovoid, granular, with punctate transverse lines and bearing nine simple setae.

The chelicera is shown in Text-fig. 41. The brush of setae on the synarthrodial membrane is three-quarters the length of the movable digit.

Genu IV with six simple setae. Tarsus II 116μ (Text-fig. 42), tibia II 76μ . Femur, genu and tibia of legs II-IV with blunt tooth-like projections basally.

MALE. Unknown.

DISTRIBUTION. Berlese (1918) recorded this species from *Phanaeus* sp. at La Plata, Argentina, and Parà, Brazil. The Museum collections contain 19 females: 10 on *Phanaeus imperator* Chevr., collected by O. W. Thomas (1904-148) in Argentina; seven on *Phanaeus bonariensis* Gory, collected by E. G. Kent (1925-262) at Asuncion, Paraguay; and two on *Phanaeus lancifer* L., labelled "S. America".

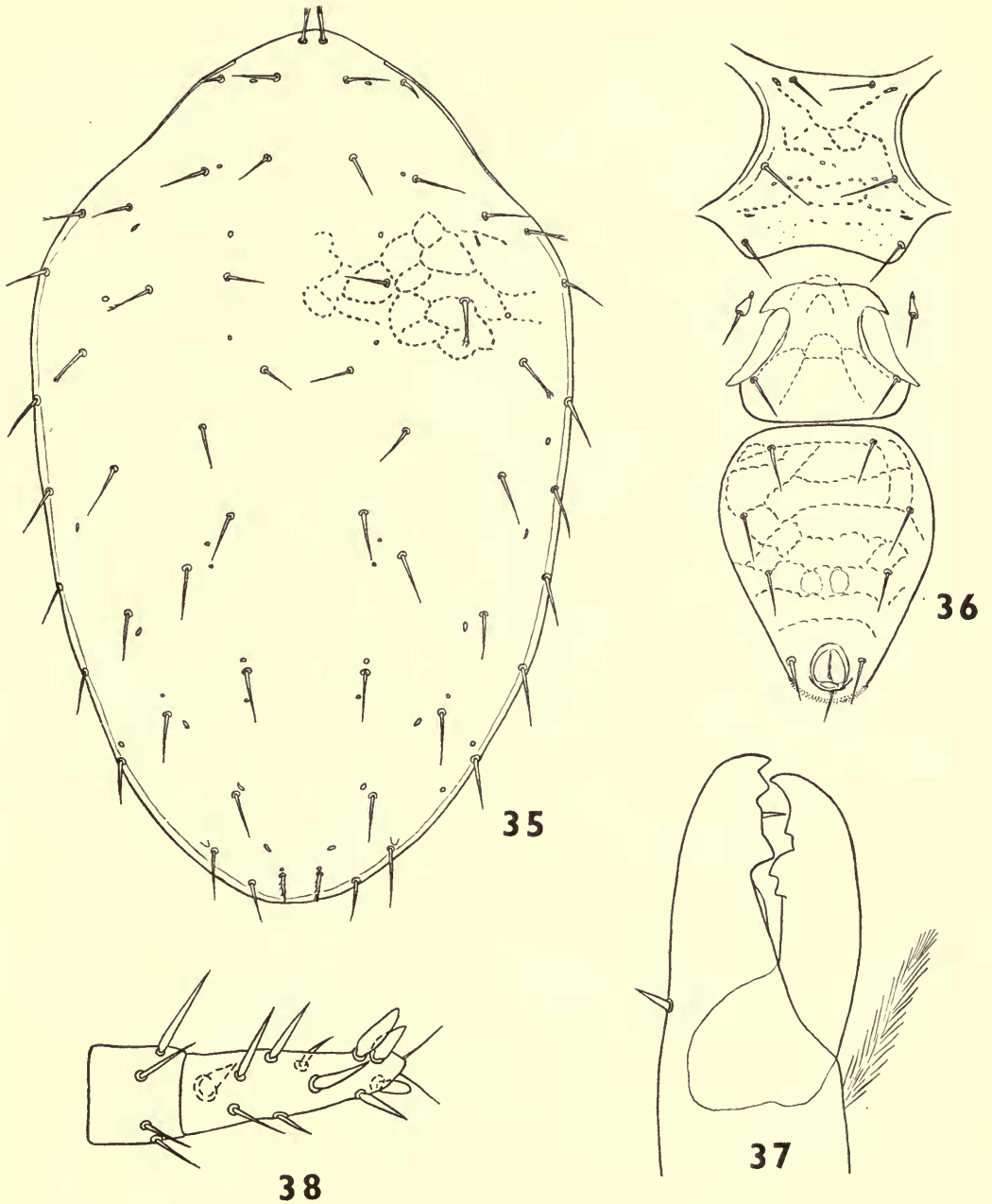
This species is superficially like *M. vernalis* Berl. in the sculpturing of the sternal shield and chaetotaxy of the dorsal shield. It differs in the size of the ventri-anal shield and in the presence of tooth-like projections from the femur, genu and tibia of legs II-IV.

Macrocheles dimidiatus Berlese, 1918

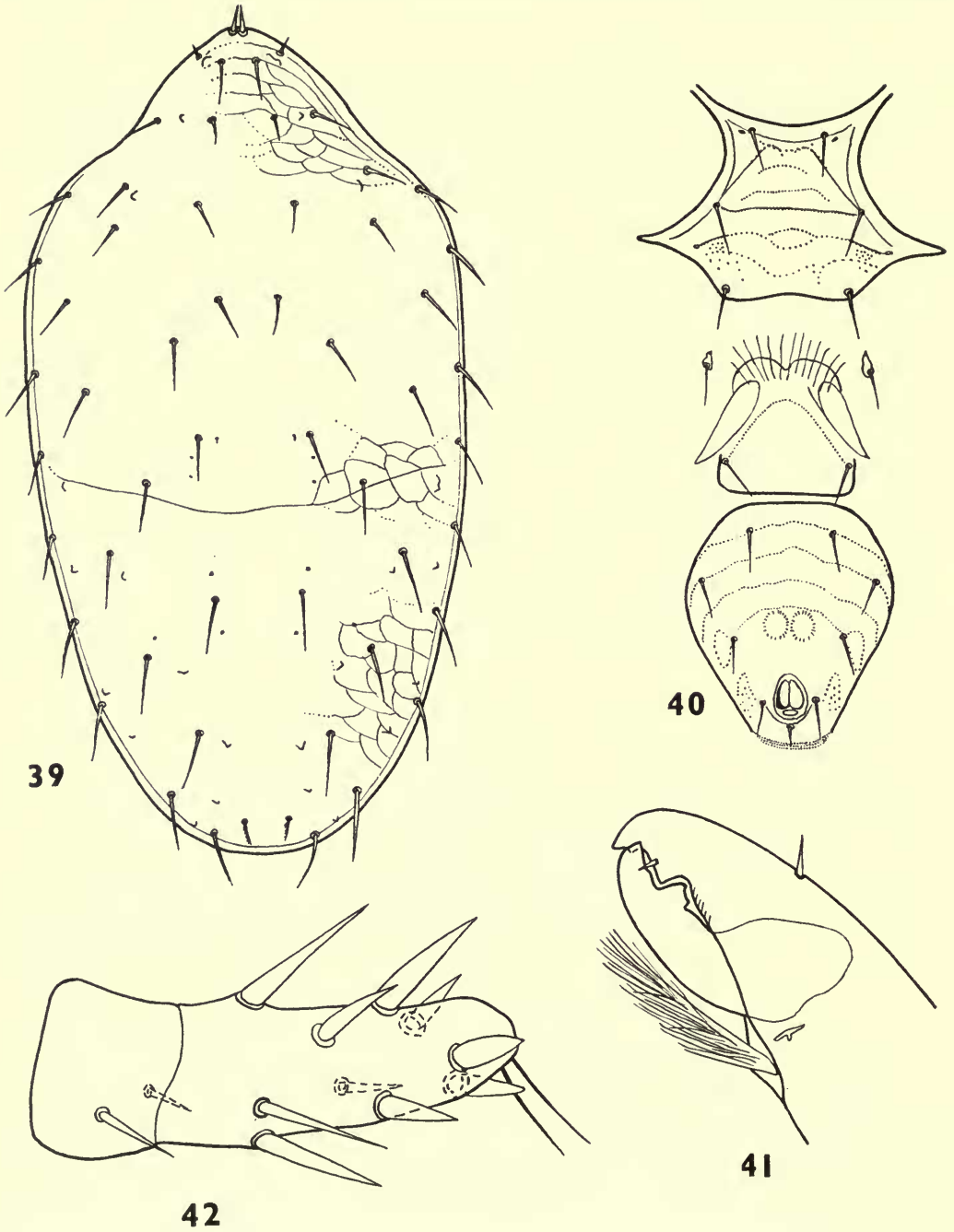
Macrocheles (Coprholaspis) dimidiatus Berlese, A., 1918, *Redia* 13 : 163.

FEMALE. Dorsal shield ($800-880\mu$ long \times $466-570\mu$ wide) granular, with areas of reticulations and areolations, and with a strongly-recurved line medially and bearing 28 pairs of setae (Text-fig. 43). Setae 11, the verticals, are broad and leaf-like with finely-dentate margins. Setae 22, 15 and J3 are simple; all remaining setae are noticeably bipectinate.

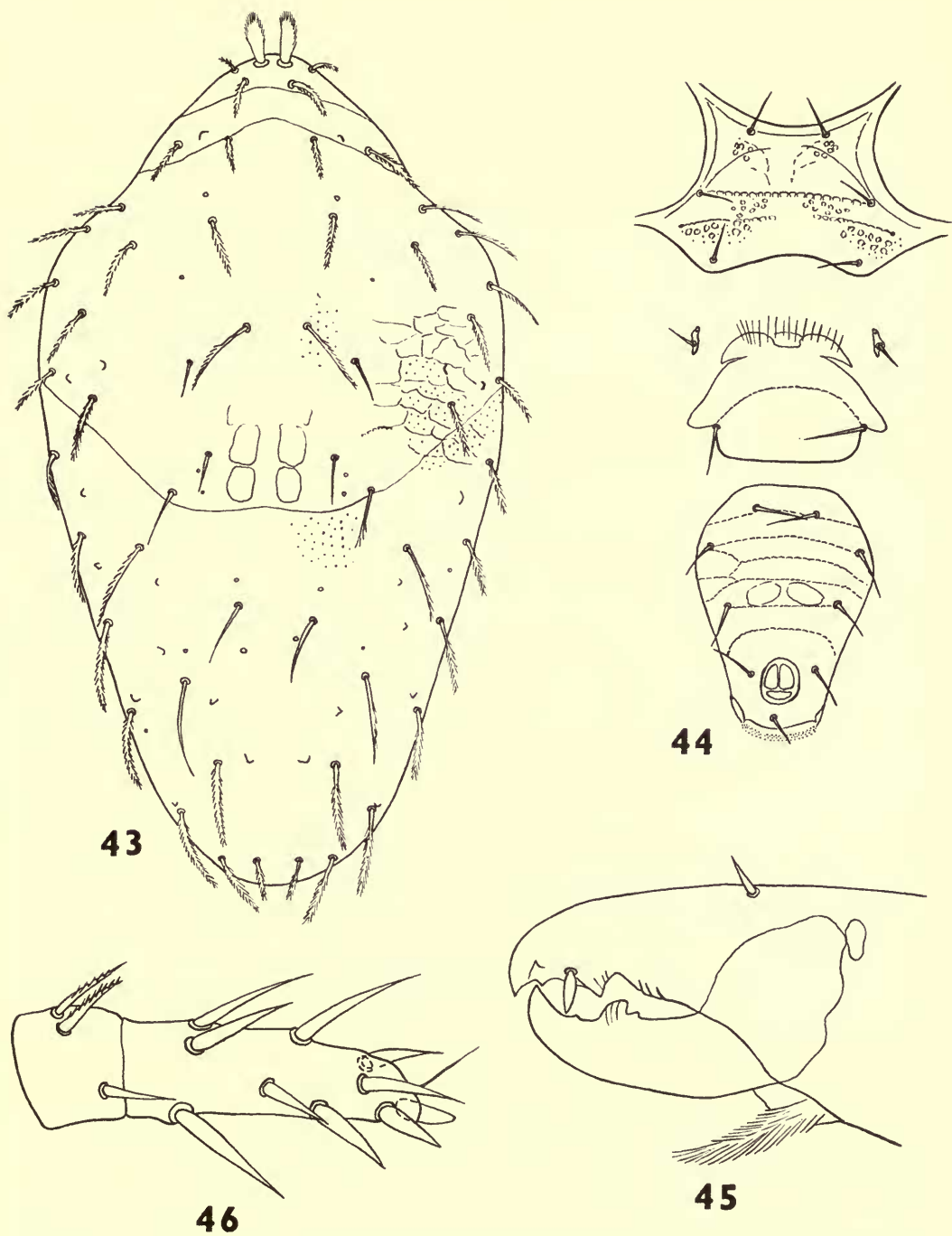
Sternal shield granular, *areae punctatae* conspicuous. *L.m.t.* slightly recurved, *l.arc.* strongly recurved, discontinuous medially (Text-fig. 44). Genital shield broad, truncated posteriorly and finely granular. Ventri-anal shield (242μ long \times 173μ



FIGS. 35-38. *Macrocheles ceylonicus* sp. nov., female. Fig. 35, dorsal shield. Fig. 36, ventral shields. Fig. 37, chelicera. Fig. 38, tarsus II.



FIGS. 39-42. *Macrocheles cognatus* Berlese, female. Fig. 39, dorsal shield. Fig. 40, ventral shields. Fig. 41, chelicera. Fig. 42, tarsus II.



FIGS. 43-46. *Macrocheles dimidiatus* Berlese, female. Fig. 43, dorsal shield. Fig. 44, ventral shields. Fig. 45, chelicera. Fig. 46, tarsus II.

wide) truncated anteriorly, granular and with transverse punctate lines. All nine ventri-anal setae are simple.

The chelicera is shown in Text-fig. 45. The brush-like process of the synarthrodial membrane is short. Six rows of deutosternal teeth.

Genu IV with six stout setae all of which are strongly pilose. Tarsus II 169μ (Text-fig. 46), tibia II 100μ .

MALE. Unknown.

DISTRIBUTION. Berlese (1918) described this species from many examples on *Phanaeus splendidulus* Fabr. and other *Phanaeus* spp., and on *Bombus* sp. at La Plata and Buenos Aires, Argentina. The Museum collections contain females from *Phanaeus amythaon* Harold at Jalisco, Guadalajara, Mexico; from *Phanaeus splendidulus* nr. Santos, Ilha Santo Amara, Brazil; from *Phanaeus faunus* Fabr. in the Forest Santarem, Lower Amazons; from *Phanaeus ensifer* Germ. at Nanahua, Paraguayan Chaco; and from *Phanaeus carnifex* L. at Deer Lodge, Tennessee.

Macrocheles distanti sp. nov.

FEMALE. Dorsal shield ($671-748\mu$ long \times $385-451\mu$ wide) granular, ornamentation of faint reticulations and bearing 28 pairs of setae (Text-fig. 47). The majority of the dorsal setae are finely pectinate distally but the following are simple: 11, 51, 55, 14, 15, 22, 23 and J3.

Sternal shield granular with punctate *liniae*. *L.m.t.* irregular, *l.o.p.* almost horizontal, continuous (Text-fig. 48). Genital shield granular. Ventri-anal shield ($198-242\mu$ long \times $165-212\mu$ wide) variable in outline, granular and with punctate transverse lines. All nine setae are simple.

The chelicera is shown in Text-fig. 49. The brush-like process of the synarthrodial membrane is a little over half the length of the movable digit. Six rows of deutosternal teeth.

Genu IV with six stout simple setae. Tarsus II 167μ (Text-fig. 50), tibia II 118μ .

MALE. Unknown.

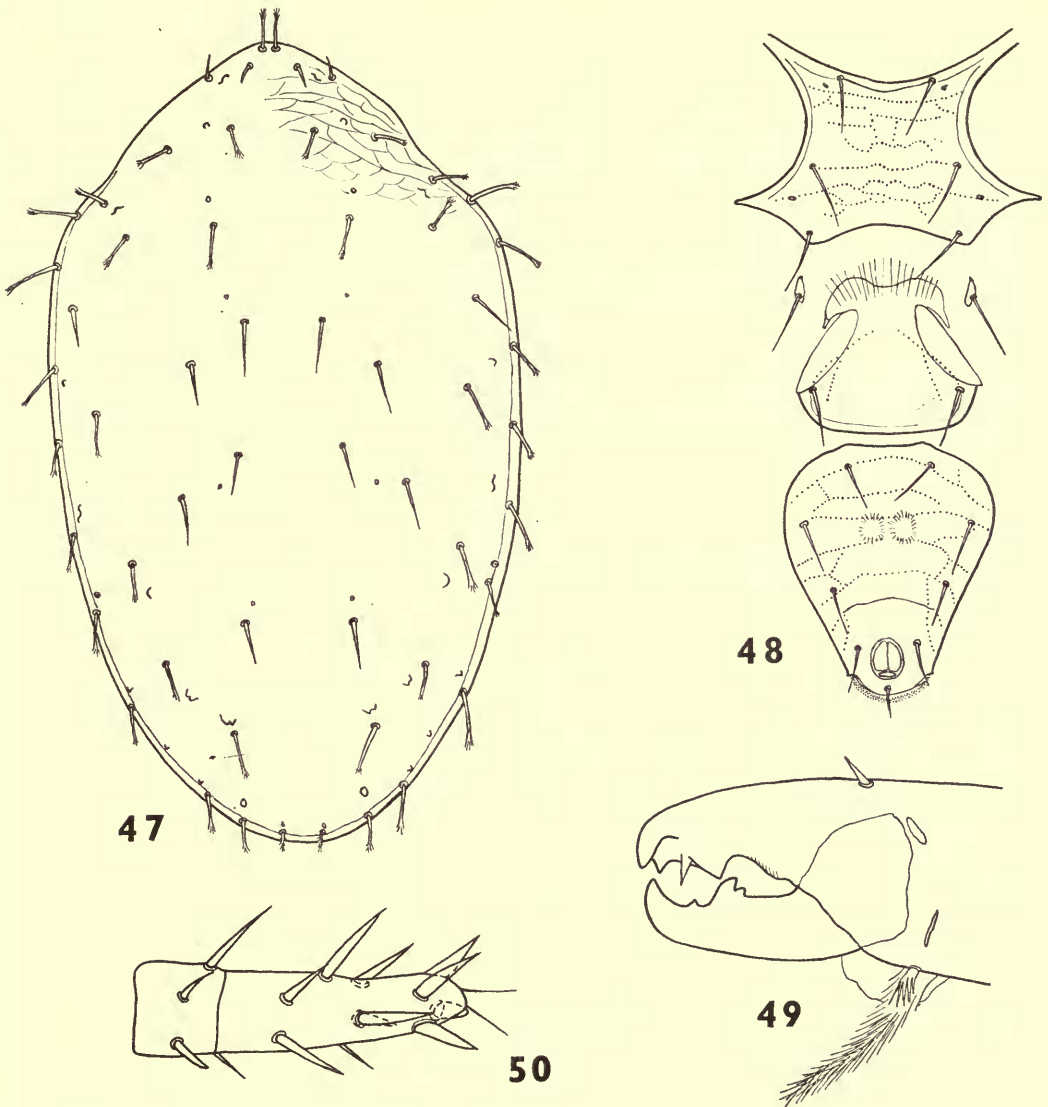
LOCALITIES. The holotype female (1961.7.14.410) and seven paratypes (1961.7.14.411-417) on *Scarabaeus bonellii* McLeay, collected by Miss A. Mackie (1948-528) at Nieuwoudtville, Cape Province; six paratypes (1961.7.14.418-423) also from *Scarabaeus bonellii*, collected by W. L. Distant (1911-383) at Cape Town; four paratypes (1961.7.14.425-428) on *Circellium bacchus* Fabr., collected by Distant at Brak Kloof Farm, Transvaal; and one paratype (1961.7.14.424) on *Circellium bacchus* in the Fry collection (1905-100) from Grahamstown, Cape Province.

Macrocheles inornatus sp. nov.

FEMALE. Dorsal shield (515μ long \times 330μ wide) granular with fine reticulations only around the margin, and bearing 28 pairs of setae (Text-fig. 51). All setae are simple; the verticals, 11, are well separated.

Sternal shield granular. *L.m.t.* absent, *l.arc.* recurved, discontinuous medially (Text-fig. 52). Genital shield granular, severely truncated posteriorly. Ventri-anal shield (175μ long \times 139μ wide) devoid of ornamentation.

The chelicera is shown in Text-fig. 53. The brush-like process of the synarthrodial membrane is three-quarters the length of the movable digit. Six rows of deutosternal teeth.

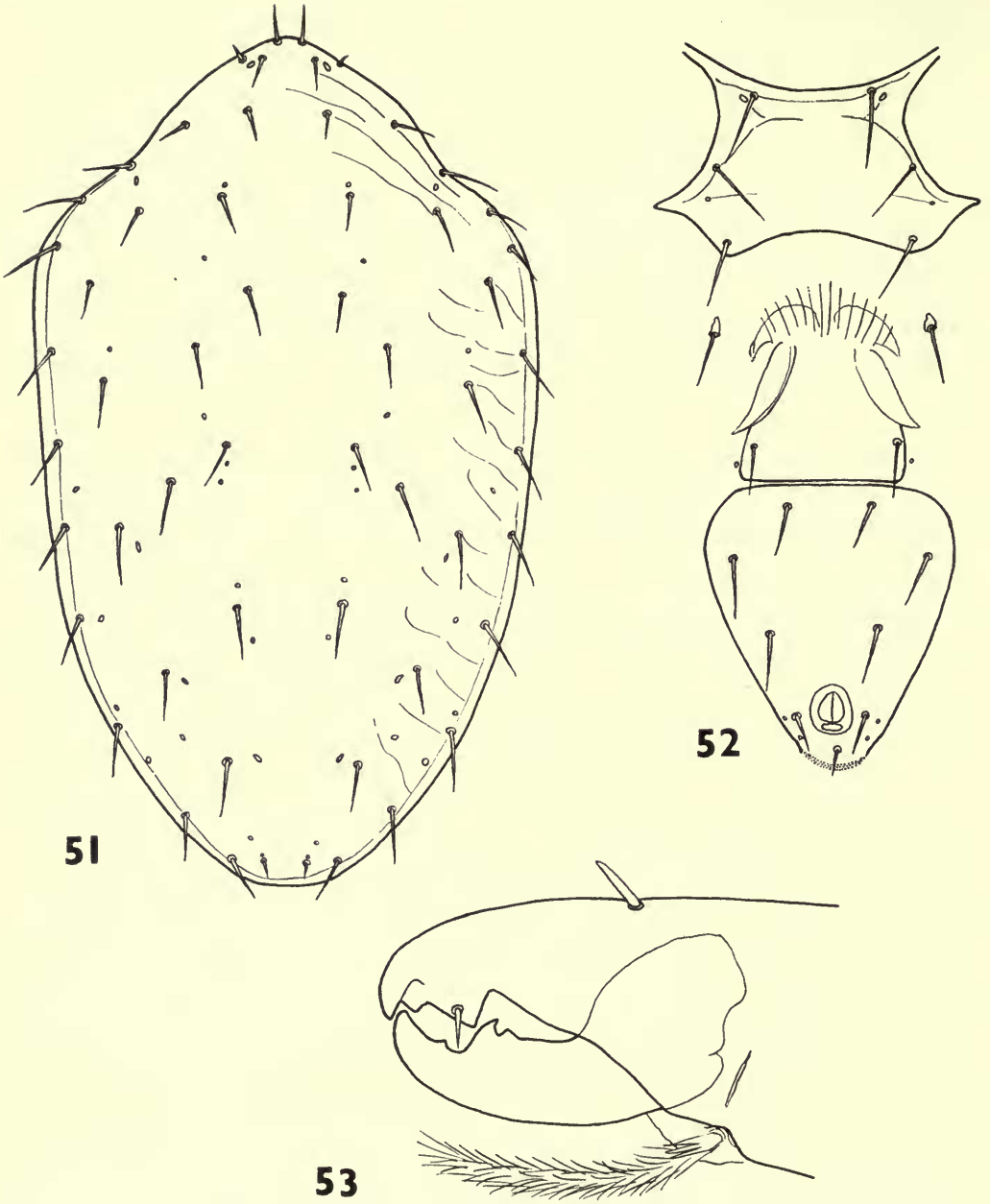


FIGS. 47-50. *Macrocheles distanti* sp. nov., female. Fig. 47, dorsal shield. Fig. 48, ventral shields. Fig. 49, chelicera. Fig. 50, tarsus II.

Genu IV with six slender simple setae. Chaetotaxy of legs simple.

MALE. Unknown.

LOCALITY. The holotype female (1961.7.14.367) and one paratype (1961.7.14.368) on *Anomiopsis heteroclytum* Blanch., collected by K. J. Hayward (1933-333) at



Figs. 51-53. *Macrocheles inornatus* sp. nov., female. Fig. 51, dorsal shield. Fig. 52, ventral shields. Fig. 53, chelicera.

Patquia, La Rioja Province, Argentina; and six paratypes (1961.7.14.369-374) on *Anomiopsis bilobum* Burm., collected by Antonio Martinez (1946-1964) at Tinogasta, Catamarca, Argentina.

***Macrocheles japonicus* sp. nov.**

FEMALE. Dorsal shield (743μ long \times 435μ wide) finely granular, with faint reticulations and bearing 28 pairs of setae (Text-fig. 54). The majority of the dorsal setae are very finely pilose in their distal halves, but the following are simple: 11, 12, 14, 15, 22 and J3. The verticals, 11, are contiguous. A faint procurved line extends across the dorsal shield medially.

Sternal shield with faint punctate ornamentation. *L.m.t.* slightly procurved, *l.o.p.* short (Text-fig. 55). Genital shield broad and granular, truncated posteriorly. Ventri-anal shield (268μ long \times 227μ wide) with fine punctate transverse lines. All setae short and simple.

The chelicera is shown in Text-fig. 56. The brush-like process of the synarthrodial membrane is half the length of the movable digit. Six rows of deutosternal teeth.

Genu IV with six short stout setae all of which are pectinate distally. Tarsus II (Text-fig. 57) 159μ , tibia II 123μ .

MALE. Unknown.

LOCALITY. The holotype female (1961.7.14.257) and four paratypes (1961.7.14.258-261) on *Gymnopleurus sinuatus* Oliv., collected by G. Lewis (1910-320) in Japan.

***Macrocheles krantzii* sp. nov.**

FEMALE. Dorsal shield (530μ long \times 290μ wide) with very faint reticulations and bearing 28 pairs of short slender simple setae (Text-fig. 58).

Sternal shield granular with *limiae* short and punctate (Text-fig. 59). Genital shield granular, short and truncated posteriorly. Ventri-anal shield (180μ long \times 130μ wide) ovoid, truncated posteriorly, and with transverse reticulation. The nine setae are simple.

The chelicera is shown in Text-fig. 60. The brush-like process of the synarthrodial membrane is very short. Six rows of deutosternal teeth.

Genu IV with six simple setae. Tarsus II 93μ (Text-fig. 61), tibia II 82μ .

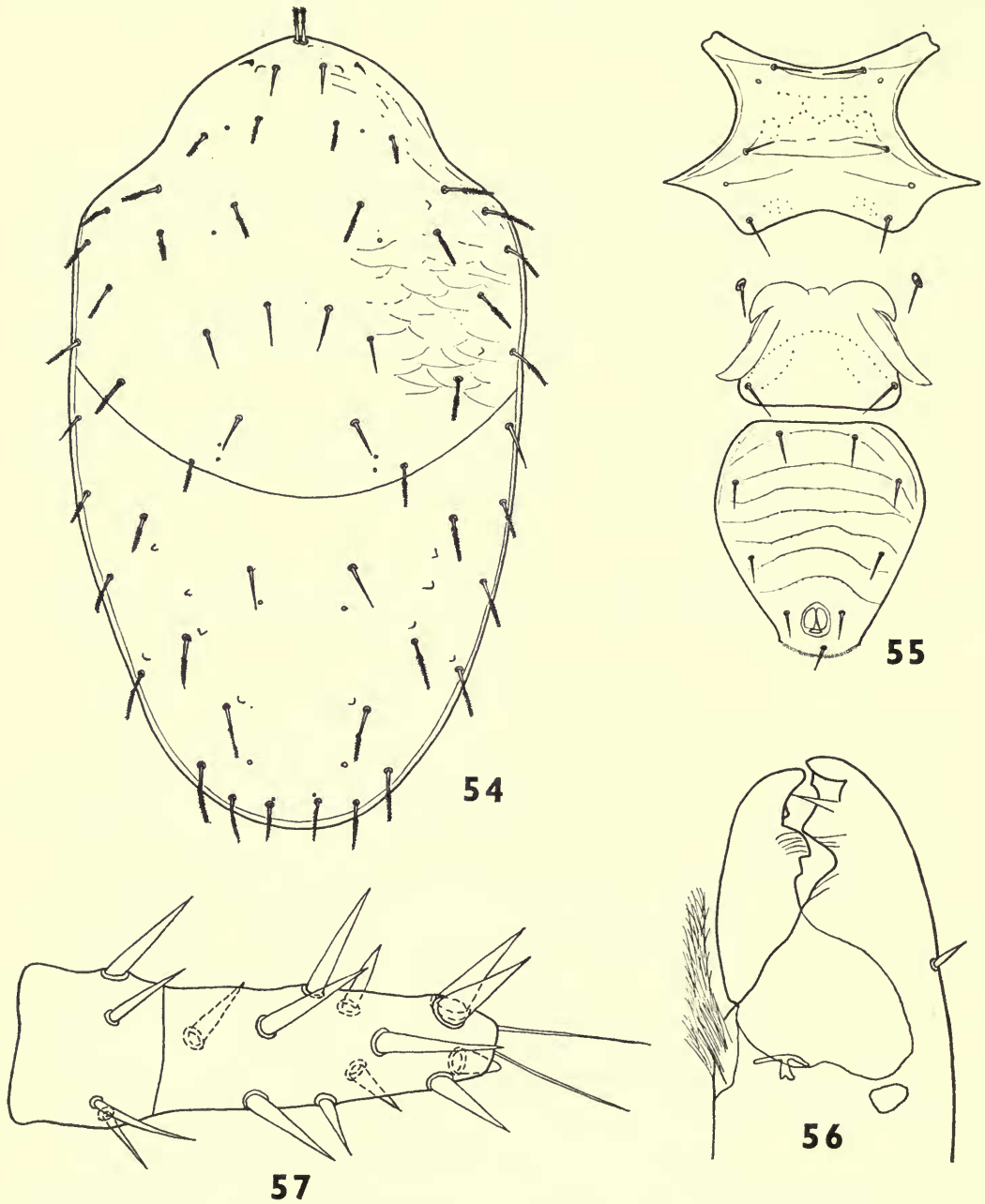
MALE. Unknown.

LOCALITIES. The holotype female (1961.7.14.545) on *Scarabaeus brahminus* Cast., collected by D. A. Thrower (1935-98) at Namakal, Salem, S. India; and one paratype (1961.7.14.546) on *Scarabaeus erichsoni* Harold, collected by J. J. Walker (1890-80) at Colombo, Ceylon.

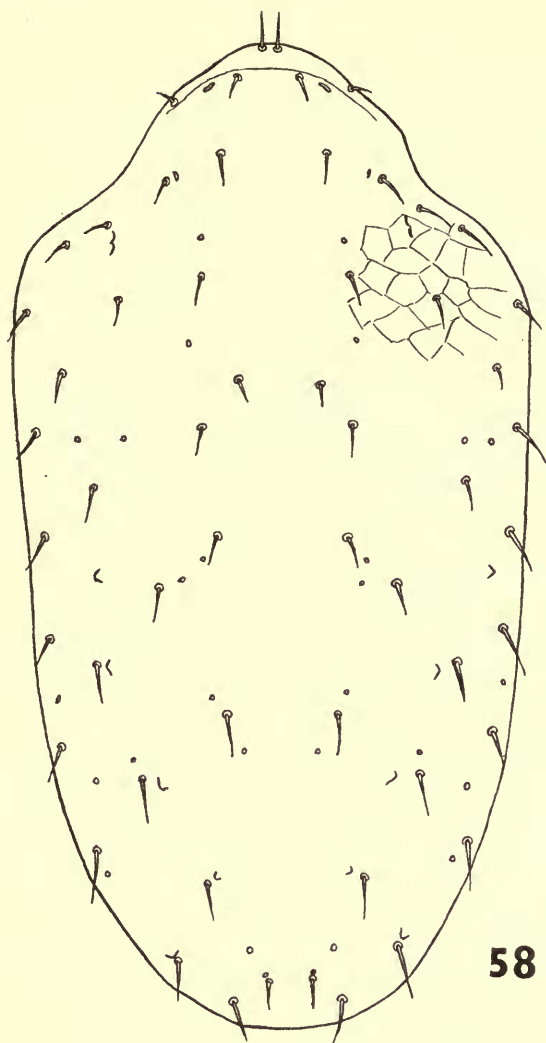
This species is named after Dr. G. W. Krantz.

***Macrocheles longisetis* sp. nov.**

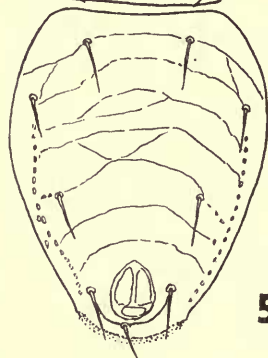
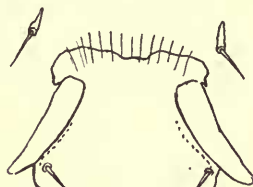
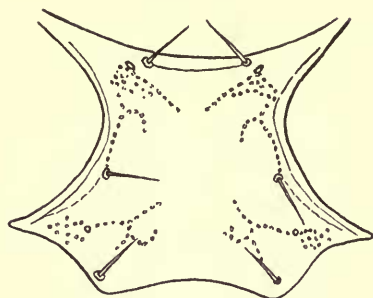
FEMALE. Dorsal shield ($1,000\mu$ long \times 610μ wide) with faint scattered areas of reticulation only, and bearing 28 pairs of setae (Text-fig. 62). The majority of the setae are long (up to 132μ), slender and pilose distally, but the following six pairs



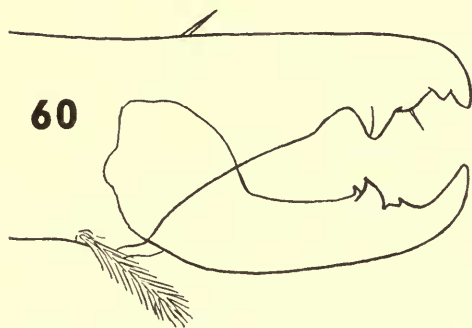
FIGS. 54-57. *Macrocheles japonicus* sp. nov., female. Fig. 54, dorsal shield. Fig. 55, ventral shields. Fig. 56, chelicera. Fig. 57, tarsus II.



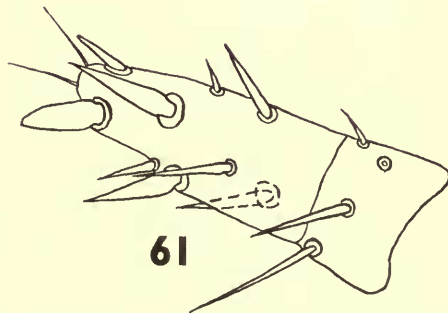
58



59



60



61

FIGS. 58-61. *Macrocheles krantzi* sp. nov., female. Fig. 58, dorsal shield. Fig. 59, ventral shields. Fig. 60, chelicera. Fig. 61, tarsus II.

are simple: *ix*, *i4*, *i5*, *z2*, *z3* and *J3*. The verticals, *ix*, are two diameters of their bases apart.

Sternal shield granular, without *liniae*, markedly concave both anteriorly and posteriorly, sternal setae long (c. 110μ) (Text-fig. 63). Genital shield broad posteriorly, granular. Ventri-anal shield (370μ long \times 320μ wide) finely granular and bearing nine simple setae.

The chelicera is shown in Text-fig. 64. The brush-like process of the synarthrodial membrane is short. Six rows of deutosternal teeth.

Genu IV with six simple setae of which the erect *al* is the longest. Tarsus II (Text-fig. 65) 207μ , tibia II 129μ .

MALE. Unknown.

LOCALITIES. The holotype female (1961.7.14.281) on *Mnematium marginatum* Péring, in the Fry collection (1905-100) from Kaffra, South Africa; and five paratypes also on *Mnematium marginatum* in South Africa, one (1961.7.14.282) collected by Pascoe (1893-60) in Little Namaqualand, and four (1961.7.14.283-286) in the Nevinson collection (1918-14) from Port Nolloth.

Macrocheles malabaricus sp. nov.

FEMALE. Dorsal shield (651μ long \times 415μ wide) finely granular, with only faint areas of reticulation, and bearing 28 pairs of setae (Text-fig. 66). In the unique specimen many of the setae are broken off at the tips, but they are probably all simple except the finely pilose pair *J5*.

The characteristic feature of this species is the ornamentation of the sternal shield which is granular with a unique linear pattern (Text-fig. 67). *L.m.t.* is undulating but does not reach the bases of setae II. *L.o.p.* curves up and meets *l.m.t.* towards the centre. The genital shield is granular and truncated posteriorly. The ventri-anal shield (206μ long \times 164μ wide) is smooth in outline, finely granular and without any ornamentation. The nine setae are simple.

The chelicera is shown in Text-fig. 68. The brush of setae on the synarthrodial membrane is half the length of the movable digit. Six rows of deutosternal teeth. Tectum, Text-fig. 69.

Genu IV with seven stout simple setae. Tarsus II 152μ (Text-fig. 70), tibia II 101μ .

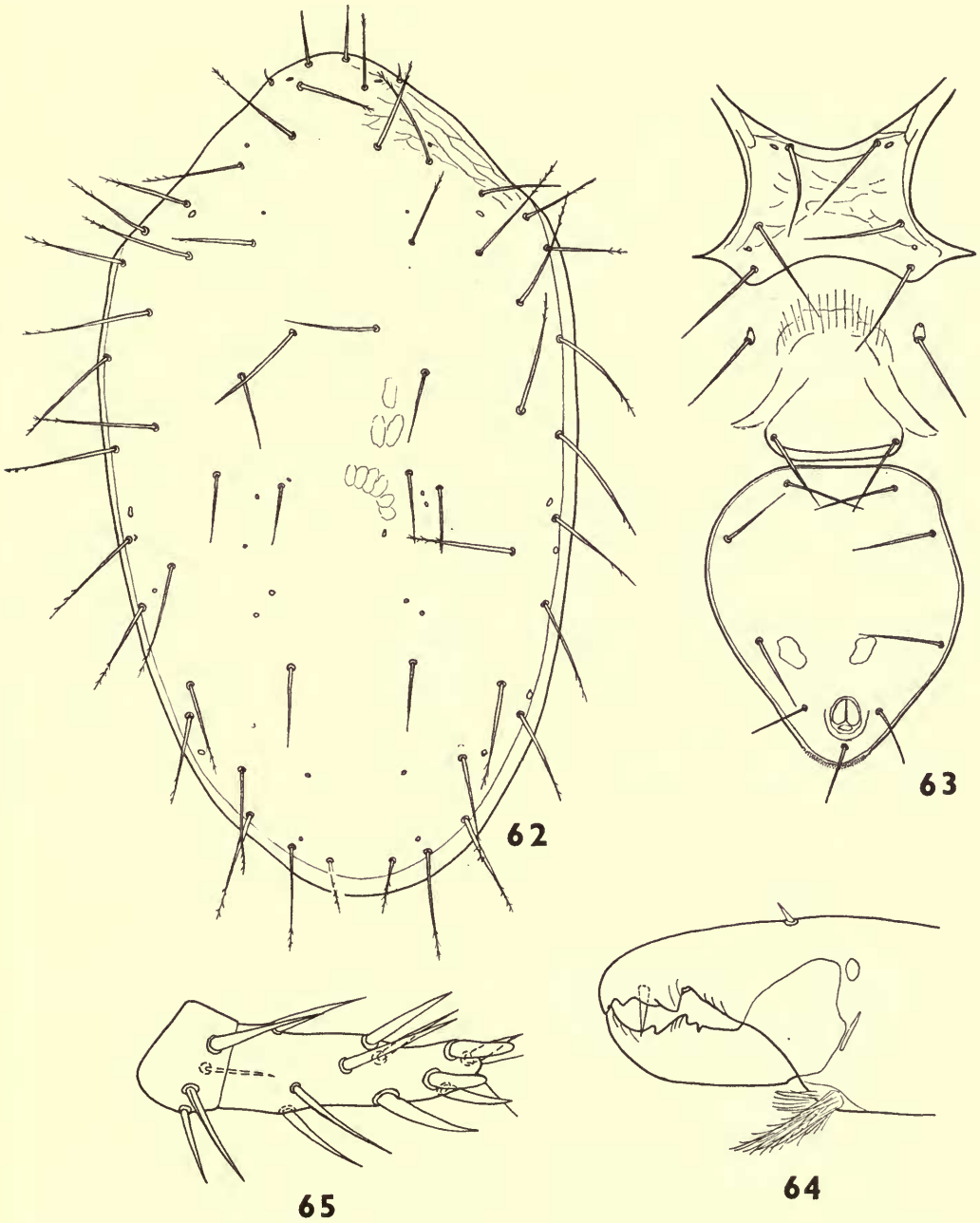
MALE. Unknown.

LOCALITY. A single female (1961.7.14.247) on *Gymnopleurus maculosus* McLeay in the Fry collection (1905-100) from Malabar, India.

Macrocheles marshalli sp. nov.

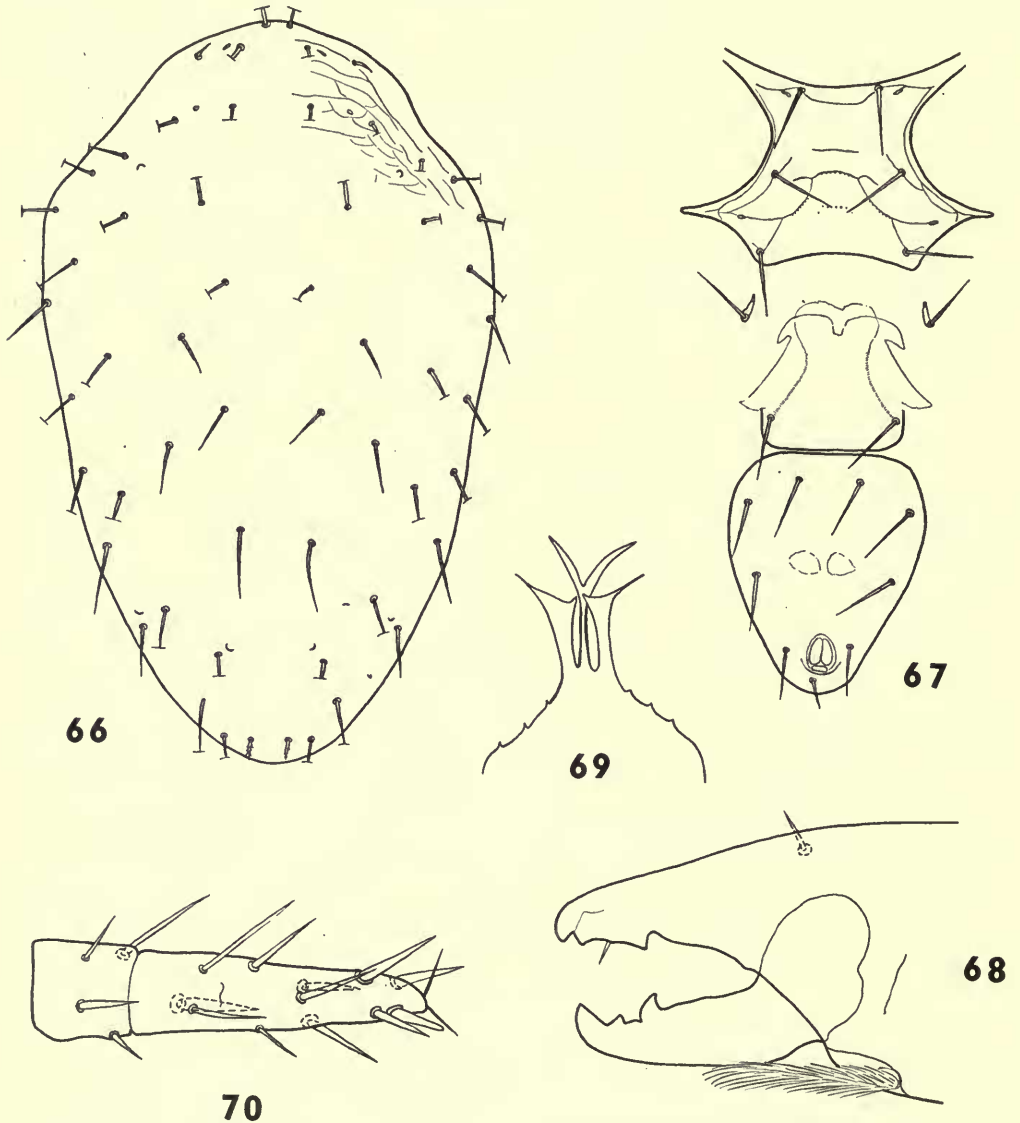
FEMALE. Dorsal shield (826μ long \times 467μ wide) finely granular, without reticulations, but with conspicuous pores and bearing 28 pairs of setae (Text-fig. 71). The majority of the dorsal setae are pilose distally with the exception of *ix*, *i4*, *i5*, *z2*, *z3* and *J3* which are simple. Setae *J5* are short and palmate.

Sternal shield reticulated in its anterior half. *L.m.t.* slightly procurved, more pronounced medially, *l.o.p.* faint, extending towards *l.m.t.* (Text-fig. 72). Genital



FIGS. 62-65. *Macrocheles longisetis* sp. nov., female. Fig. 62, dorsal shield. Fig. 63, ventral shields. Fig. 64, chelicera. Fig. 65, tarsus II.

shield granular, without ornamentation, truncated posteriorly. Ventri-anal shield (289μ long \times 258μ wide) granular and without ornamentation. A more attenuated form of ventri-anal shield is shown in Text-fig. 73.



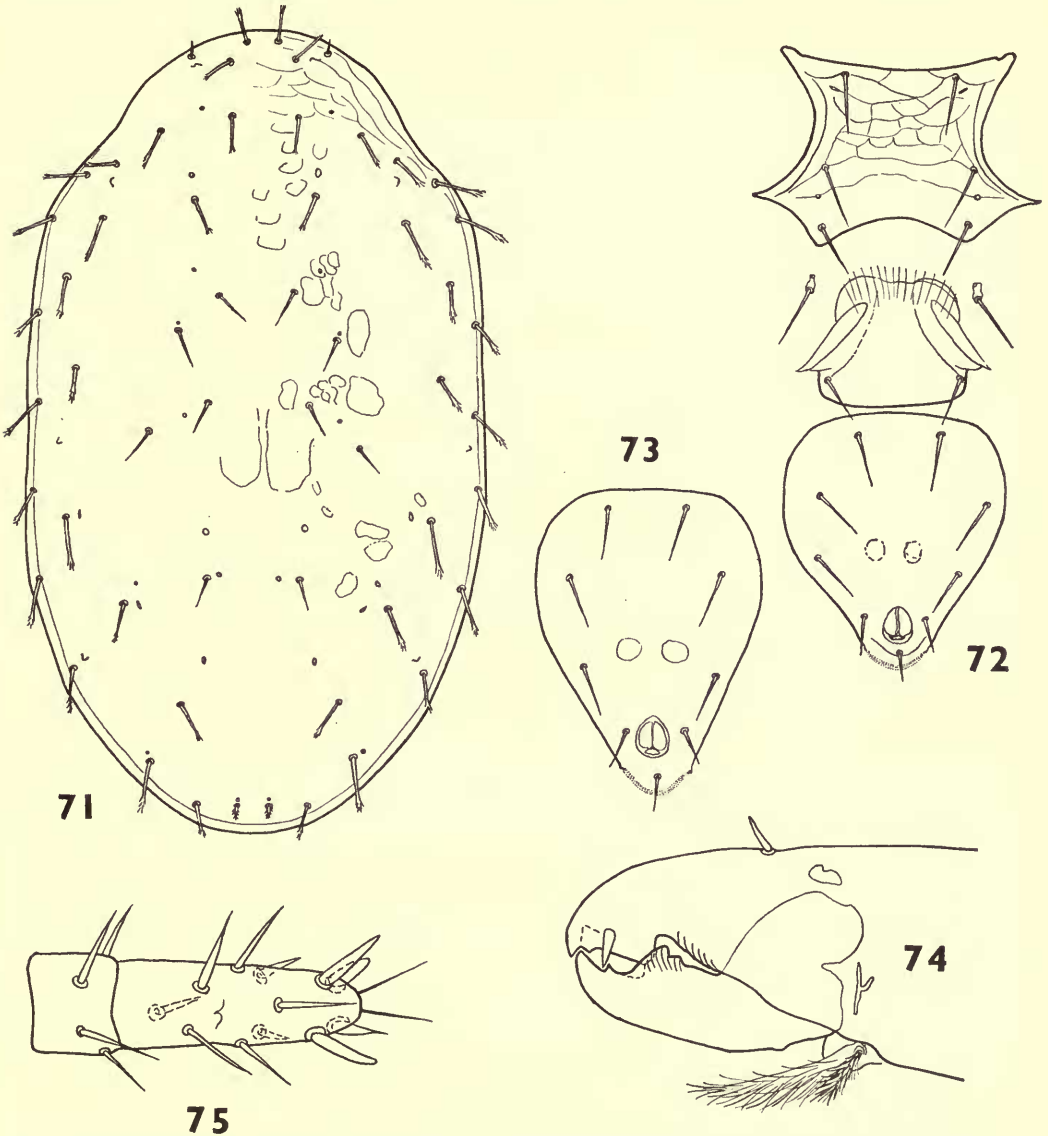
FIGS. 66-70. *Macrocheles malabaricus* sp. nov., female. Fig. 66, dorsal shield. Fig. 67, ventral shields. Fig. 68, chelicera. Fig. 69, tectum. Fig. 70, tarsus II.

The chelicera is shown in Text-fig. 74. The brush of setae on the synarthrodial membrane is half the length of the movable digit. Six rows of deutosternal teeth.

Genu IV with six stout setae of which pd_1 and pd_2 are finely pilose distally. Tarsus II (Text-fig. 75) 174μ , tibia II 103μ .

MALE. Unknown.

LOCALITIES. The holotype female (1961.7.14.334) and one paratype (1961.7.14.335) from *Sceliages adamastor* Serv., collected by Sir Guy A. K. Marshall (1904-



FIGS. 71-75. *Macrocheles marshalli* sp. nov., female. Fig. 71, dorsal shield. Fig. 72, ventral shields. Fig. 73, ventri-anal shield. Fig. 74, chelicera. Fig. 75, tarsus II.

206) at the Umfuli River and Umtali, Mashonaland, Southern Rhodesia respectively ; three paratypes (1961.7.14.336-338) also from *Sceliages adamastor*, collected by Sir Guy Marshall (1908-212) on the Upper Buzi River, Mozambique ; two paratypes

(1961.7.14.340-341) again from *Sceliages adamastor*, collected by Pascoe (1893-60) at Delaon, South Africa; and one paratype (1961.7.14.339) on *Circellium bacchus* Fabr., collected by W. L. Distant (1911-383) at Brak Kloof Farm, Transvaal.

Macrocheles mexicanus sp. nov.

FEMALE. Dorsal shield (710μ long \times 400μ wide) covered by faint punctate reticulations and bearing 28 pairs of setae (Text-fig. 76). The majority of the dorsal setae are simple, but setae i_3 , r_4 , z_1 , Z_3 , S_4 and S_5 are pilose distally.

Sternal shield large (180μ long) with a conspicuous unique pattern of areolations (Text-fig. 77). *L.ang.* short, other *liniae* absent. Genital shield broad, truncated posteriorly, and with punctate ornamentation. Ventri-anal shield (228μ long \times 195μ wide) truncated anteriorly with conspicuous transverse punctate lines. The nine ventri-anal setae are simple.

The chelicera is shown in Text-fig. 78. The brush of setae on the synarthrodial membrane is a little over half the length of the movable digit. Six rows of deutosternal teeth.

Genu IV with six stout setae all of which appear to be slightly pilose. Tarsus II (Text-fig. 79) 144μ , tibia II 88μ .

MALE. Unknown.

LOCALITY. The holotype female (1961.7.14.262) and one paratype (1961.7.14.263) on *Phanaeus palliatus* Sturm., collected by the Biologia Centrali Americana expedition (1886-90) at Jalapa, Mexico.

Macrocheles natalensis sp. nov.

FEMALE. Dorsal shield (682μ long \times 429μ wide) granular, with faint reticulations covering the entire shield, and with a procurved line medially. Twenty-eight pairs of setae (Text-fig. 80). The contiguous vertical setae, i_x , are pilose distally and setae J_5 are pilose along one margin.

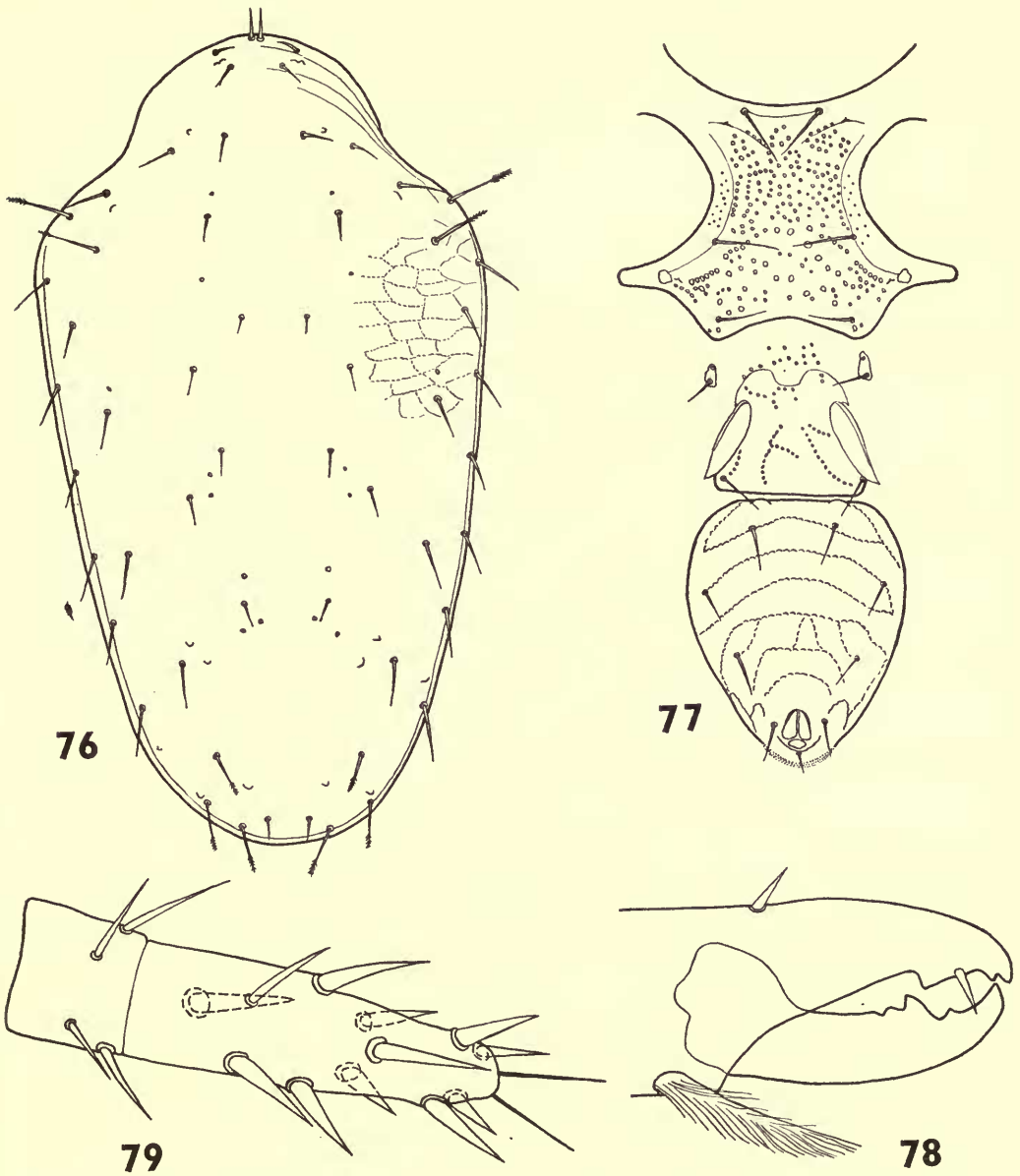
Sternal shield with a conspicuous pattern of areolations and *areae punctatae*. *L.m.t.* almost straight (Text-fig. 81). Genital shield broad, truncated posteriorly and with punctate ornamentation. Ventri-anal shield broader than long (220μ long \times 240μ wide), truncated anteriorly and bearing nine simple setae. Ornamentation consisting of transverse punctate lines and strong granulation almost covering the entire surface.

The chelicera is shown in Text-fig. 82. Brush-like process of the synarthrodial membrane short. Six rows of deutosternal teeth.

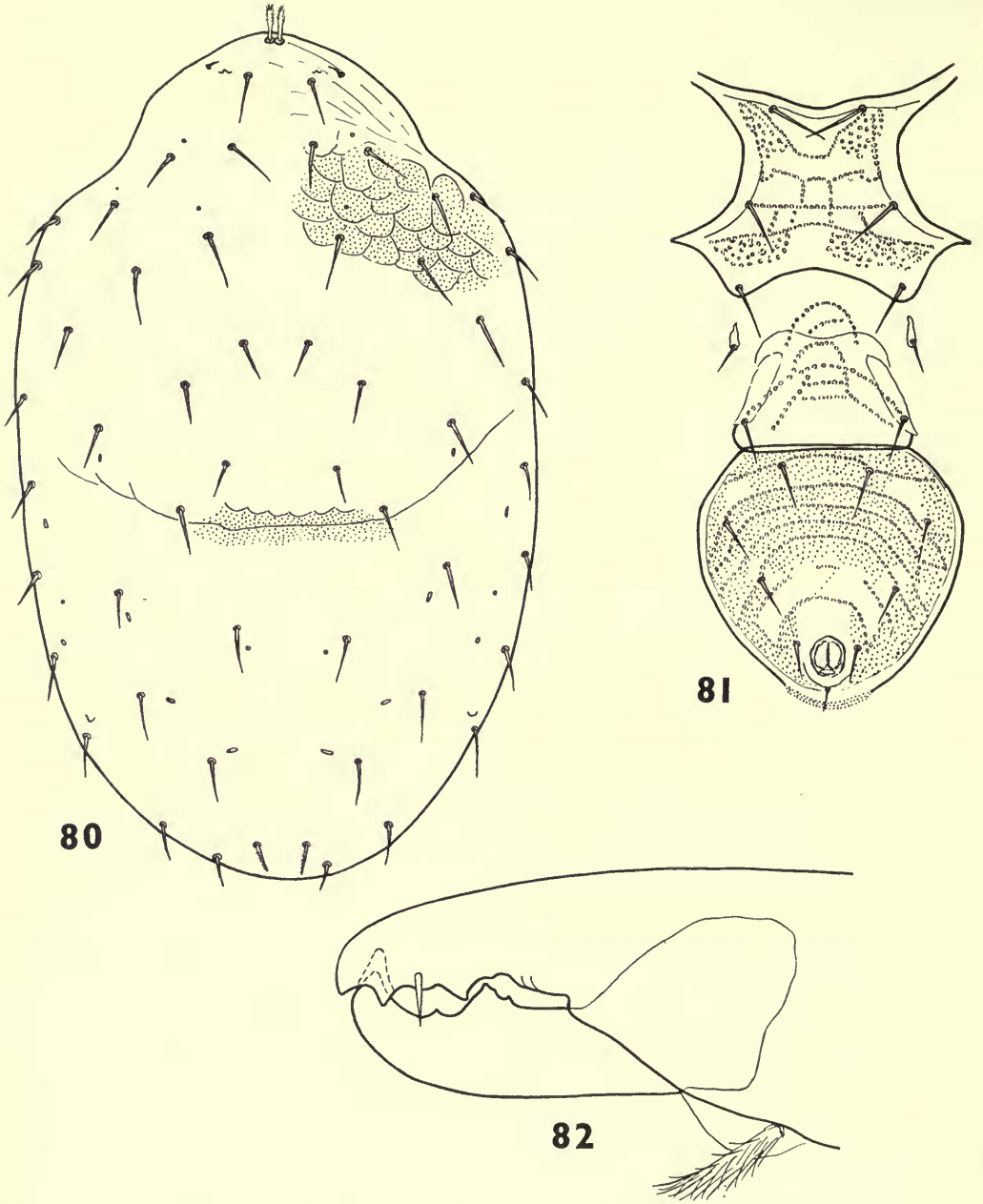
Genu IV with six stout setae of which pd_1 , pd_2 and *av* are strongly palmate. The remaining three setae are simple. Chaetotaxy of legs mainly simple, though a number of the stouter setae are palmate. Tarsus II 110μ , tibia II 99μ .

MALE. Unknown.

LOCALITY. A single female (1961.7.14.552) on *Scarabaeus cuvieri* McLeay, collected by Sir Guy A. K. Marshall (1904-206) at Natal, South Africa.



FIGS. 76-79. *Macrocheles mexicanus* sp. nov., female. Fig. 76, dorsal shield. Fig. 77, ventral shields. Fig. 78, chelicera. Fig. 79, tarsus II.



FIGS. 80-82. *Macrocheles natalensis* sp. nov., female. Fig. 80, dorsal shield. Fig. 81, ventral shields. Fig. 82, chelicera.

Macrocheles nevernalis sp. nov.

FEMALE. Dorsal shield (649–737 μ long \times 385–434 μ wide) finely granular and faintly reticulated, and bearing 28 pairs of setae (Text-fig. 83). With a few exceptions, all setae are simple. The verticals, *ir*, are pilose distally and have their bases well separated, and *S*₂–*S*₅, *Z*₂, *Z*₃ and *J*₅ are pilose distally. Setae *J*₂ absent.

Sternal shield granular (Text-fig. 84). *L.m.t.* almost straight, *l.o.p.* short. Genital shield broad and granular. Ventri-anal shield pear-shaped (220–247 μ long \times 181–209 μ wide), finely granular and with recurved transverse lines. The nine setae are simple.

The chelicera is shown in Text-fig. 85. The brush-like process of the synarthrodial membrane is short. Six rows of deutosternal teeth.

Genu IV with six setae of which two or more are slightly divided distally. Tarsus II (Text-fig. 86) 140 μ , tibia II 90 μ , all setae simple.

MALE. Unknown.

LOCALITY. The holotype female (1961.7.14.547) and four paratypes (1961.7.14.548–551) on *Scarabaeus brahminus* Cast., collected by D. A. Thrower (1935–98) at Namakal, Salem, S. India.

Macrocheles nevinsoni sp. nov.

FEMALE. Dorsal shield (760 μ long \times 475 μ wide) with only a few faint traces of ornamentation mainly around the margins, and bearing 28 pairs of strongly-bipectinate setae (Text-fig. 87). Setae *rr*, *zz*, *i*₅, *J*₃ and *J*₅ are the shortest (c. 54 μ) whilst the remaining setae are much longer (up to 143 μ) (Text-fig. 88).

Sternal shield narrow, with punctate ornamentation. *L.m.t.* very slightly procurved, *l.arc.* recurved (Text-fig. 89). Genital shield truncated posteriorly and with punctate lines. Ventri-anal shield (260 μ long \times 205 μ wide) with conspicuous punctate transverse lines and nine simple setae.

The chelicera is shown in Text-fig. 90. The brush of setae on the synarthrodial membrane is about a third the length of the movable digit. Six rows of deutosternal teeth.

Genu IV with six stout strongly-bipectinate setae. Tarsus II 155 μ (Text-fig. 91), tibia II 110 μ . A number of the stout setae on legs II–IV are also bipectinate.

MALE. Unknown.

LOCALITY. The holotype female (1961.7.14.231) and four paratypes (1961.7.14.232–235) on *Megathopa argentina* Gillet, in the Nevinson collection (1918–14) from Rio Salado, Argentina.

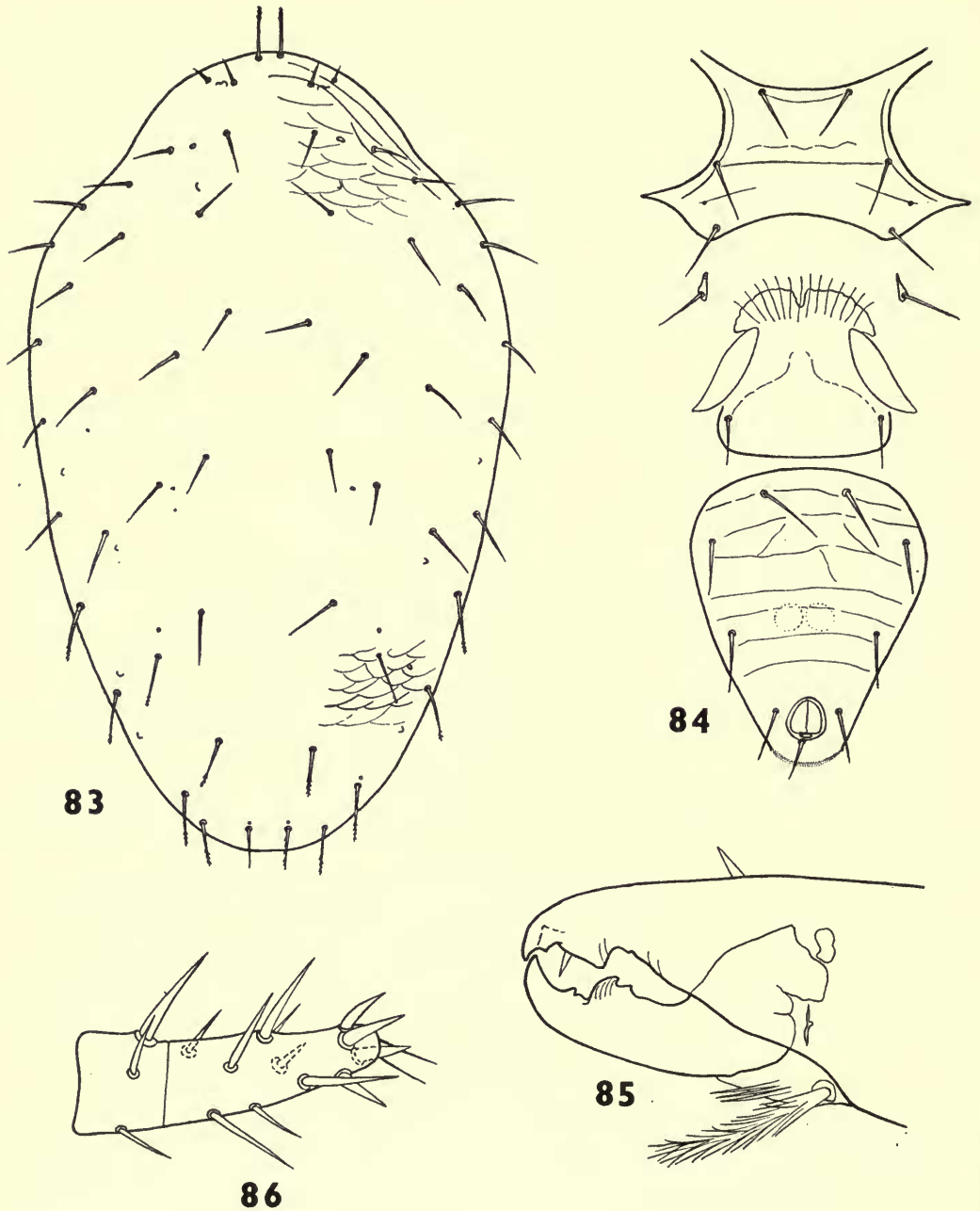
Macrocheles pisentii (Berlese, 1882)

Gamasus tardus var. *Pisentii* Berlese, A., 1882, *Bull. Soc. ent. Ital.* 14: 112, figs.

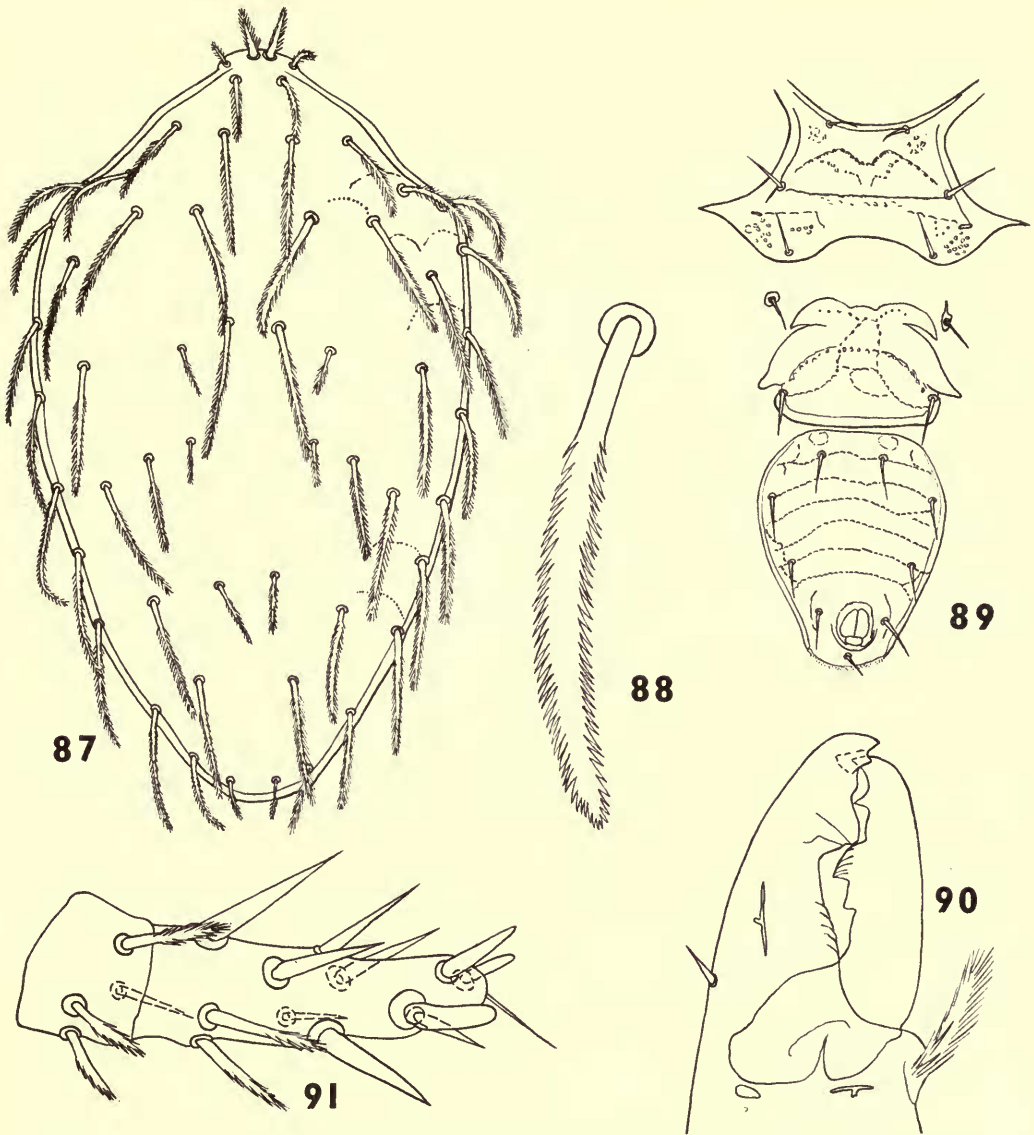
Holostaspis pisentii, Berlese, A., 1887, *Acari, Myriopoda et Scorpionnes, etc.*, Fasc. 76, No. 1.

Macrocheles pisentii Evans, G. O. and Browning, E., 1956, *Bull. Brit. Mus. (nat. Hist.)*, Zool. 4: 13, figs.

FEMALE. Dorsal shield (790–830 μ long \times 450–600 μ wide) finely granular with faint reticulation around the margins, and bearing 28 pairs of setae. The dorsal shield is figured by Evans & Browning (1956). Setae *J*₅ are short and palmate



FIGS. 83-86. *Macrocheles nevernalis* sp. nov., female. Fig. 83, dorsal shield. Fig. 84, ventral shields. Fig. 85, chelicera. Fig. 86, tarsus II.



FIGS. 87-91. *Macrocheles nevinsoni* sp. nov., female. Fig. 87, dorsal shield. Fig. 88, dorsal seta. Fig. 89, ventral shields. Fig. 90, chelicera. Fig. 91, tarsus II.

(Text-fig. 92); the remaining setae are all simple. The vertical setae, *ix*, are two diameters apart.

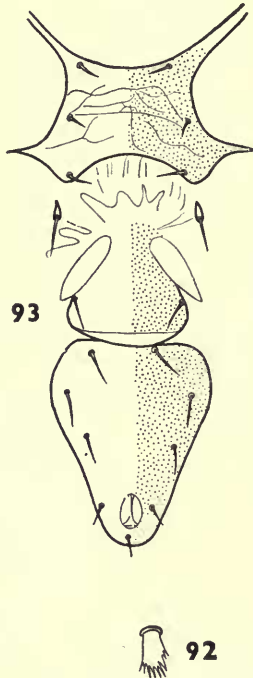
Sternal shield concave posteriorly, granular, with faint reticulations on some specimens. *L.m.t.* slightly recurved (Text-fig. 93). Genital shield granular, without ornamentation. Ventri-anal shield (260μ long \times 190μ wide) granular, attenuated posteriorly and bearing nine simple setae.

The chelicerae and tectum, which are typical of the genus, are figured by Evans & Browning (*loc. cit.*). Five rows of deutosternal teeth.

Genu IV with six stout simple setae. Chaetotaxy of legs simple.

MALE. Unknown.

DISTRIBUTION. This species was collected originally from *Scarabaeus semipunctatus* F. in Italy and has subsequently been obtained from a number of localities in Great Britain. The present collection contains many females on *Scarabaeus*



FIGS. 92-93. *Macrocheles pisentii* (Berlese), female. Fig. 92, dorsal seta J5. Fig. 93, ventral shields.

semipunctatus from Savoy & Perpignan in France, from Majorca, Algeria and the Sahara; on *Scarabaeus sacer* L. from Egypt and the Persian Gulf; on *Scarabaeus puncticollis* Latr. from Tunisia and N. Sinai; and from *Scarabaeus socotranus* Gillet from Socotra.

Macrocheles plumosus sp. nov.

FEMALE. Dorsal shield (711μ long \times 415μ wide) with a very characteristic areolate pattern, and bearing 28 pairs of setae (Text-fig. 94). The verticals, *ix*, are extremely short and palmate, *rr* are short and pilose, and *J5* are finely bipectinate. The remaining 25 pairs are up to 107μ long and very markedly bipectinate. *J2* absent.

Sternal shield covered entirely by a conspicuous reticulation. *L.m.t.* entire, slightly undulating, other structural lines forming an integral part of the ornamentation (Text-fig. 95). Genital shield broad, truncated posteriorly, and with some ornamentation. Ventri-anal shield (247μ long \times 247μ wide) pear-shaped, with conspicuous transverse lines and lateral ornamentation. The post-anal seta is short and pilose, the remaining eight are simple.

The chelicera is shown in Text-fig. 96. The brush of setae on the synarthrodial membrane is short. Five rows of deutosternal teeth.

Genus IV with six strongly pilose setae. Tarsus II 135μ (Text-fig. 97), tibia II 88μ .

MALE. Dorsal shield (507μ long \times 361μ wide) with ornamentation and chaetotaxy as in the female, except that *z2* and *i5* are simple. Sterniti-genital shield with five pairs of simple setae; ornamentation as in the female sternal shield. Ventri-anal shield (169μ long \times 169μ wide) with ornamentation and chaetotaxy similar to the female.

The chelicera is shown in Text-fig. 98. The spermatophoral process is slender. Synarthrodial brush very short.

Genus IV with six pilose setae. Femur II with a thumb-like spur ventrally. Remaining chaetotaxy of the legs typical.

LOCALITY. The holotype female (1952.9.8.478), allotype male (1952.9.8.481) and two paratype females (1952.9.8.479-480) on "Beetle F240" collected by the Oxford University Expedition to Sarawak, 28.x.1932.

Macrocheles pyriformis sp. nov.

FEMALE. Dorsal shield (795μ long \times 415μ wide) granular and with faint reticulations, more noticeably anteriorly, and bearing 28 pairs of setae (Text-fig. 99). All setae are simple except *J5* which are short and palmate. The verticals, *i1*, are well separated.

Sternal shield squarish, with a linear ornamentation, *liniae* obscured (Text-fig. 100). Genital shield granular, without ornamentation, truncated posteriorly. Ventri-anal shield (268μ long \times 227μ wide) markedly attenuated posteriorly, finely granular and with faint transverse lines. The nine ventri-anal setae are simple.

The chelicera is shown in Text-fig. 101. The brush-like process of the synarthrodial membrane is about half the length of the movable digit. Seven rows of deutosternal teeth.

Genus IV with six stout setae all of which are longer than usual and simple. Tarsus II (Text-fig. 102) 126μ , tibia II 101μ .

MALE. Unknown.

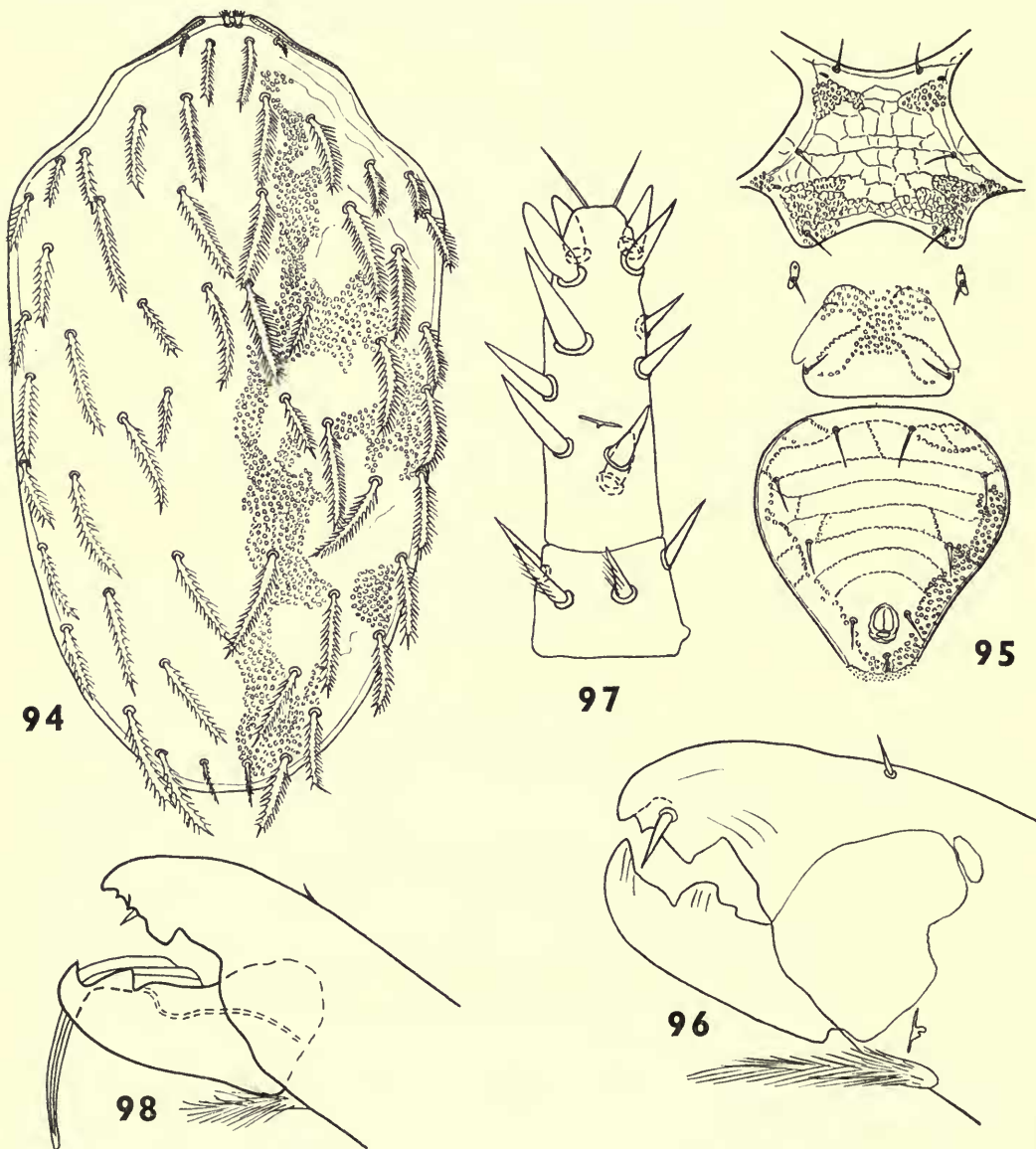
LOCALITY. The holotype female (1961.7.14.287) and six paratypes (1961.7.14.288-293) on *Mnematium ritchiei* McLeay in the Nevinson collection (1918-14) labelled "Tripolitania 1899".

Macrocheles rhodesi sp. nov.

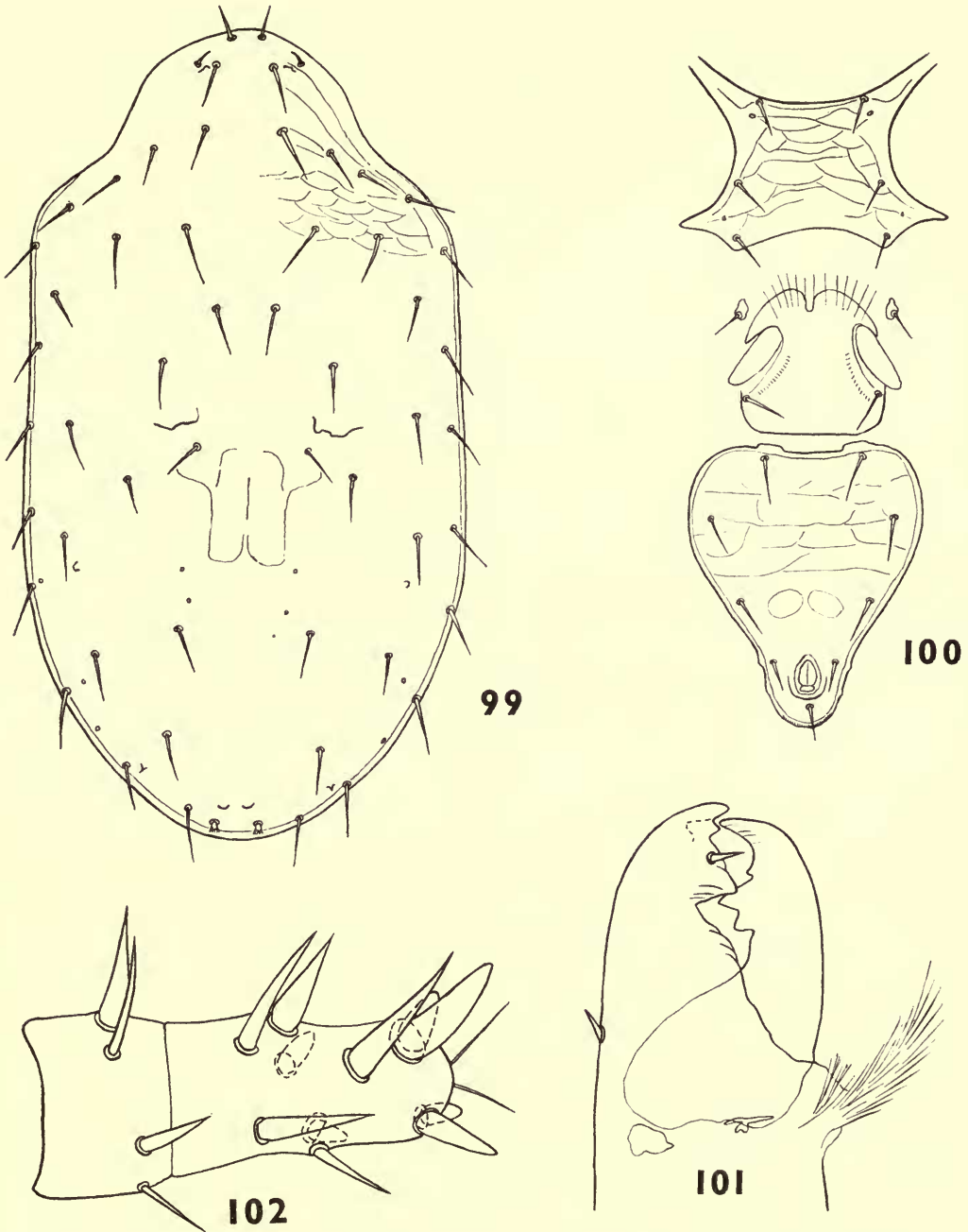
FEMALE. Dorsal shield (726μ long \times 473μ wide) with very faint reticulations, a faint procurved transverse line mid-dorsally, and bearing 28 pairs of setae (Text-

fig. 103). The vertical setae, *ix*, with their bases touching, are directed anteriorly and are slightly pilose distally. Setae *J5* are lightly bipectinate along their entire lengths; all remaining setae are simple.

Sternal shield granular, faint traces of punctate ornamentation, *l.m.t.* almost straight, other *liniae* absent (Text-fig. 104). Genital shield broad, truncated pos-



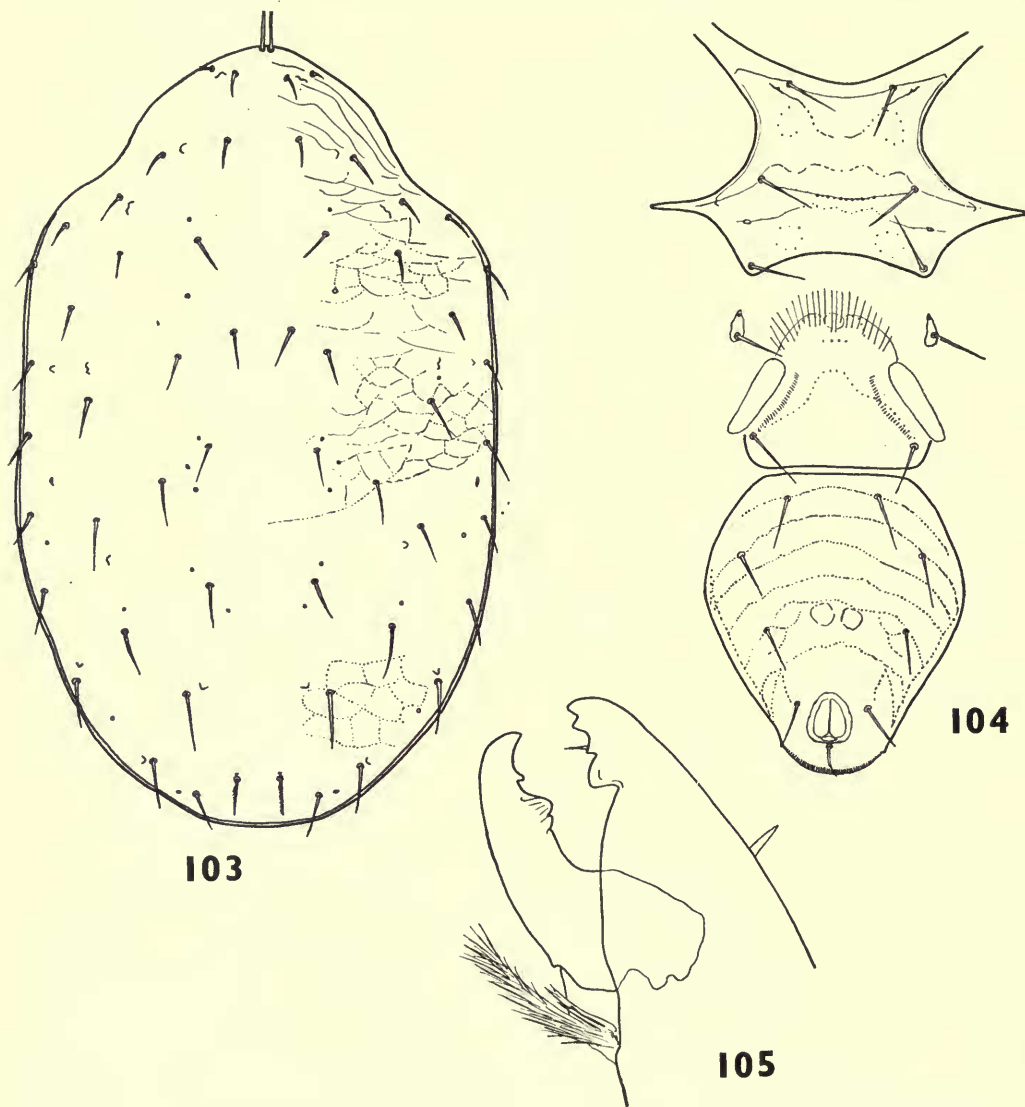
FIGS. 94-98. *Macrocheles plumosus* sp. nov. Fig. 94, dorsal shield of female. Fig. 95, ventral shields of female. Fig. 96, chelicera of female. Fig. 97, tarsus II of female. Fig. 98, chelicera of male.



FIGS. 99-102. *Macrocheles pyriformis* sp. nov., female. Fig. 99, dorsal shield. Fig. 100, ventral shields. Fig. 101, chelicera. Fig. 102, tarsus II.

teriorly. Ventri-anal shield (240μ long \times 220μ wide) ovoid, truncated anteriorly, with strongly recurved transverse lines and bearing nine simple setae.

The chelicera is shown in Text-fig. 105. The brush-like process of the synarthrodial membrane is half the length of the movable digit. Six rows of deutosternal teeth.



FIGS. 103-105. *Macrocheles rhodesi* sp. nov., female. Fig. 103, dorsal shield. Fig. 104, ventral shields. Fig. 105, chelicera.

Genus IV with six stout setae of which *av* and *al* only are simple, the four dorsal setae being slightly pilose distally. Tarsus II 143μ , tibia II 95μ .

MALE. Unknown.

LOCALITIES. The holotype female (1961.7.14.342) and five paratypes (1961.7.14.343-347) on *Gymnopleurus azureus* Fabr., collected in the Serenje District, NE. Rhodesia, by S. A. Neave (1907-230); four paratypes (1961.7.14.348-351) on *Sebasteos laticeps* Péring in the Nevinson collection (1918-14) from Adelaide, Cape Province; and a single paratype (1961.7.14.352) on *Sebasteos galenus* Westw., collected by Sir Guy A. K. Marshall (1931-138) at Salisbury, Southern Rhodesia.

Macrocheles rykei sp. nov.

FEMALE. Dorsal shield (792-902 μ long \times 484-524 μ wide) granular with a finely dotted reticulated pattern, and bearing 28 pairs of setae (Text-fig. 106). The following setae are pilose distally: i2, s2, s5, s6, r4, r5, r7, Z1, S4, S5 and J5; the remainder are simple. The verticals, i1, are well separated and directed anteriorly.

Sternal shield granular, irregularly concave posteriorly. *L.m.t.* slightly procurved, undulating, other *liniae* scarcely visible (Text-fig. 107). Genital shield finely granular, truncated posteriorly. Ventri-anal shield (242-286 μ long \times 187-242 μ wide) slightly attenuated posteriorly, finely granular and with transverse dotted lines. The nine setae are simple.

The chelicera is shown in Text-fig. 108. The brush-like process of the synarthrodial membrane is short. Six rows of deutosternal teeth.

Genu IV with six stout setae. Tarsus II 177 μ (Text-fig. 109), tibia II 113 μ .

MALE. Unknown.

LOCALITIES. The holotype female (1961.7.14.391) and one paratype (1961.7.14.392) on *Scarabaeus bonellii* McLeay, collected by W. L. Distant (1911-383) at Cape Town; eight paratypes (1961.7.14.393-400) also on *Scarabaeus bonellii*, collected by Miss A. Mackie (1948-525) at Nieuwoudtville; and nine paratypes (1961.7.14.401-409) on *Gymnopleurus unicolor* Fähr., collected by R. E. Turner (1924-109) at Port St. John, Pondoland. All localities are in South Africa.

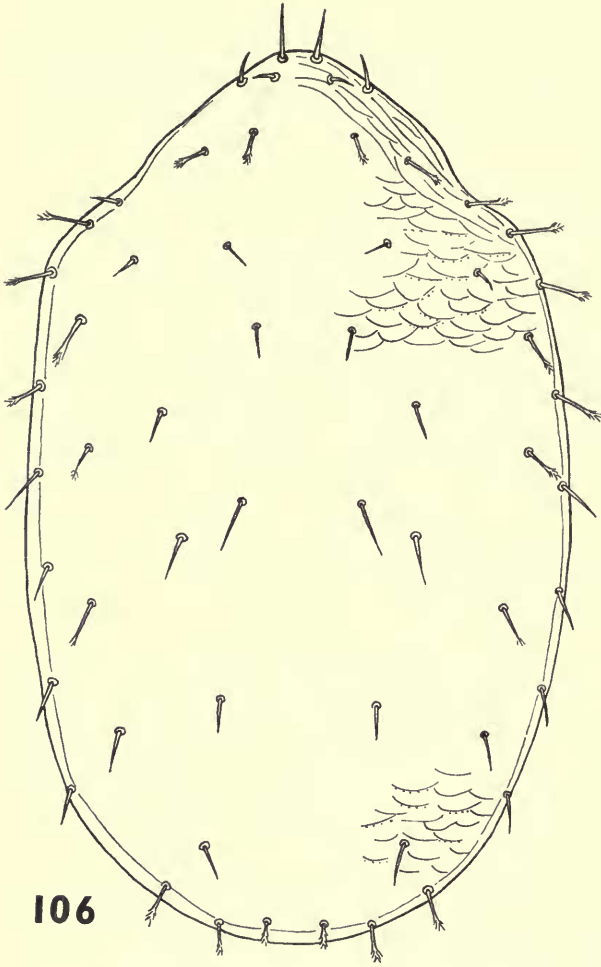
This species is named after Dr. P. A. J. Ryke.

Macrocheles sternalis sp. nov.

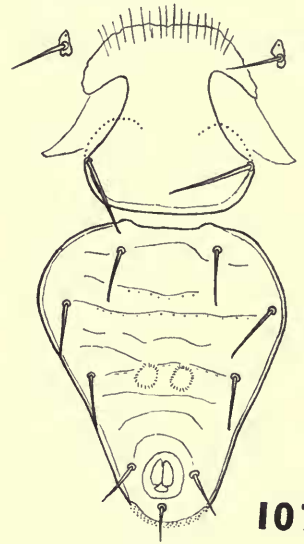
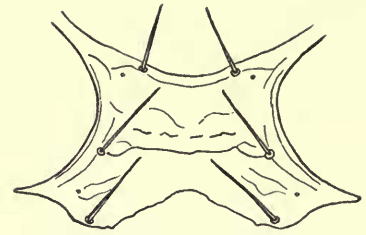
FEMALE. Dorsal shield (910 μ long \times 518 μ wide) finely granular, with only traces of ornamentation, and bearing 28 pairs of setae (Text-fig. 110). The chaetotaxy of the dorsal shield is not complete in the unique specimen, but, nevertheless, the verticals, i1, are separated by about three times the diameter of their bases, and it would appear that all the setae are pilose distally with the exception of r1 which are short and spinose.

Sternal shield granular, *liniae* very indistinct, but with a U-shaped mark medially (Text-fig. 111). In the unique specimen the right metasternal shield is fused with the sternal shield. Genital shield broad, shallow, and granular. Ventri-anal shield (320 μ long \times 330 μ wide) with an irregular concavity anteriorly, finely granular but without distinct ornamentation. With the exception of the paranals, which are simple, the remaining seven ventri-anal setae are slightly split distally.

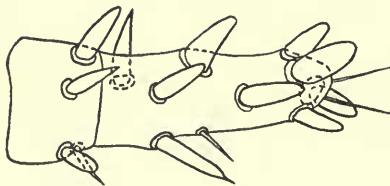
The chelicera is shown in Text-fig. 112. The brush-like process of the synarthrodial membrane is half the length of the movable digit. Six rows of deutosternal teeth.



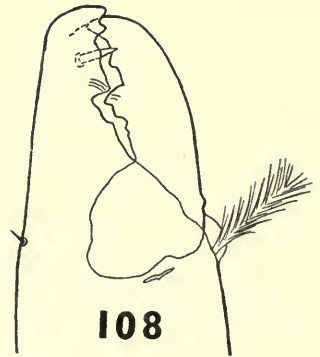
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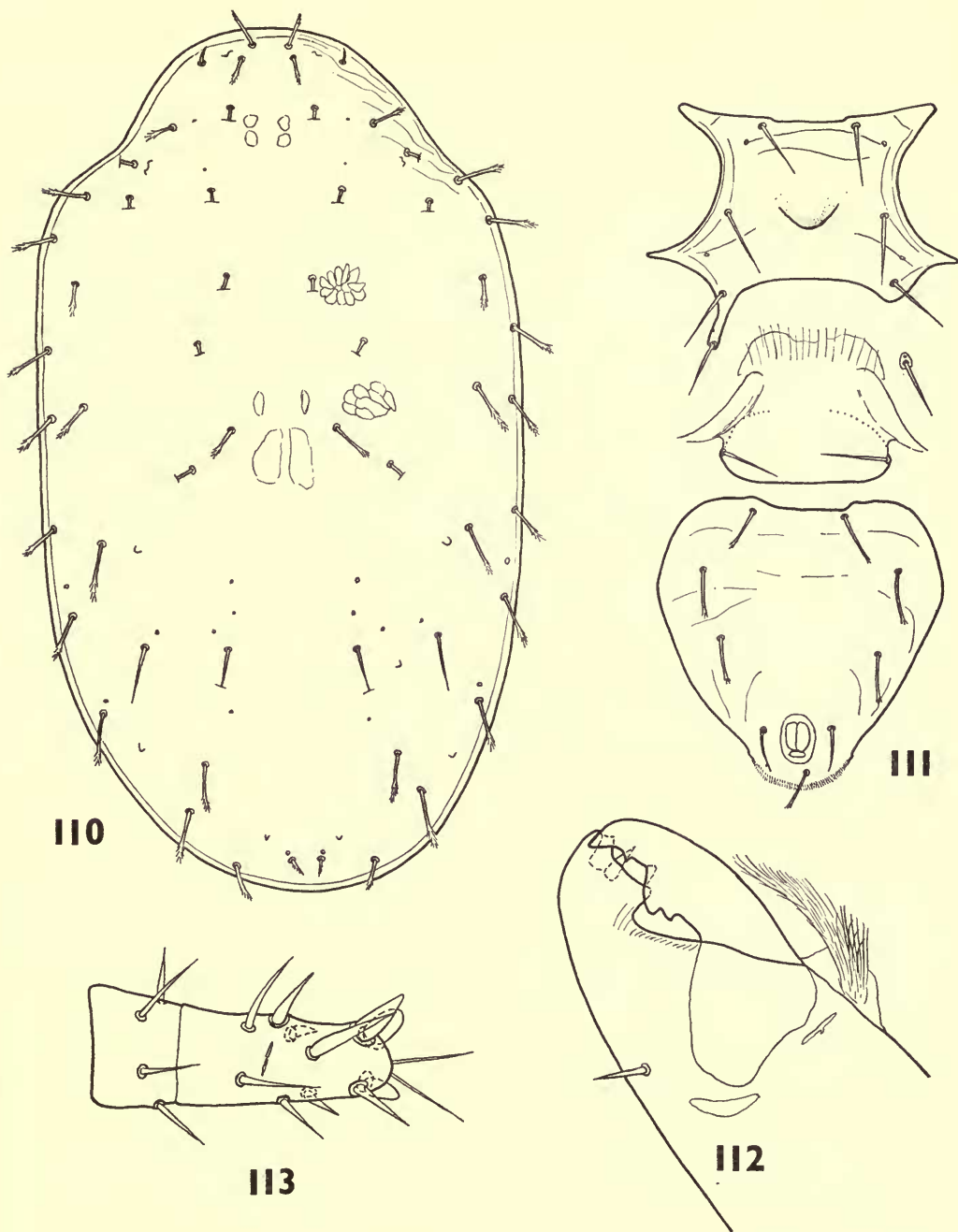


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108

FIGS. 106-109. *Macrocheles rykei* sp. nov., female. Fig. 106, dorsal shield. Fig. 107, ventral shields. Fig. 108, chelicera. Fig. 109, tarsus II.



FIGS. 110-113. *Macrocheles sternalis* sp. nov., female. Fig. 110, dorsal shield. Fig. 111, ventral shields. Fig. 112, chelicera. Fig. 113, tarsus II.

Genus IV with six setae, all of which are pilose distally. Tarsus II (Text-fig. 113) 162 μ , tibia II 114 μ .

MALE. Unknown.

LOCALITY. A single female (1961.7.14.333) on *Sceliages augias* Gillet, collected by Dr. L. Lloyd (1913-170) in Northern Rhodesia.

***Macrocheles telamoni* sp. nov.**

FEMALE. Dorsal shield (826 μ long \times 467 μ wide) with areas of punctate ornamentation, and bearing 28 pairs of setae. There are a pair of rounded protuberances at the bases of setae Z1 (Text-fig. 114). With the exception of setae i5, which are simple, all setae are strongly bipectinate.

Sternal shield finely granular, with a coarse area of punctations exterior to the posterior sternal setae (Text-fig. 115). *L.m.t.* slightly recurved, discontinuous medially, *l.arc.* only rudimentary. Genital shield granular, truncated posteriorly. Ventri-anal shield (240 μ long \times 197 μ wide) truncated anteriorly, granular, and with transverse lines, all setae simple.

The chelicera is shown in Text-fig. 116. The brush-like process of the synarthrodial membrane is about two-thirds the length of the movable digit. Six rows of deutosternal teeth.

Genus IV with seven stout setae, all of which are bipectinate. Tarsus II (Text-fig. 117) 177 μ , tibia II 113 μ .

MALE. Unknown.

LOCALITY. The holotype female (1961.7.14.353) and four paratypes (1961.7.14.354-357) on *Phanaeus telamon* Erichs., collected by the Biologia Centrali Americana expedition (1886-90) at Volcan de Chiriqui, Panama.

***Macrocheles thomasseti* sp. nov.**

FEMALE. Dorsal shield (711 μ long \times 435 μ wide) finely granular and with areas of reticulation, and bearing 28 pairs of setae (Text-fig. 118). Setae r4 and r5 are lightly pilose distally and J5 are short and bipectinate. The remaining setae are simple although a few may appear split distally.

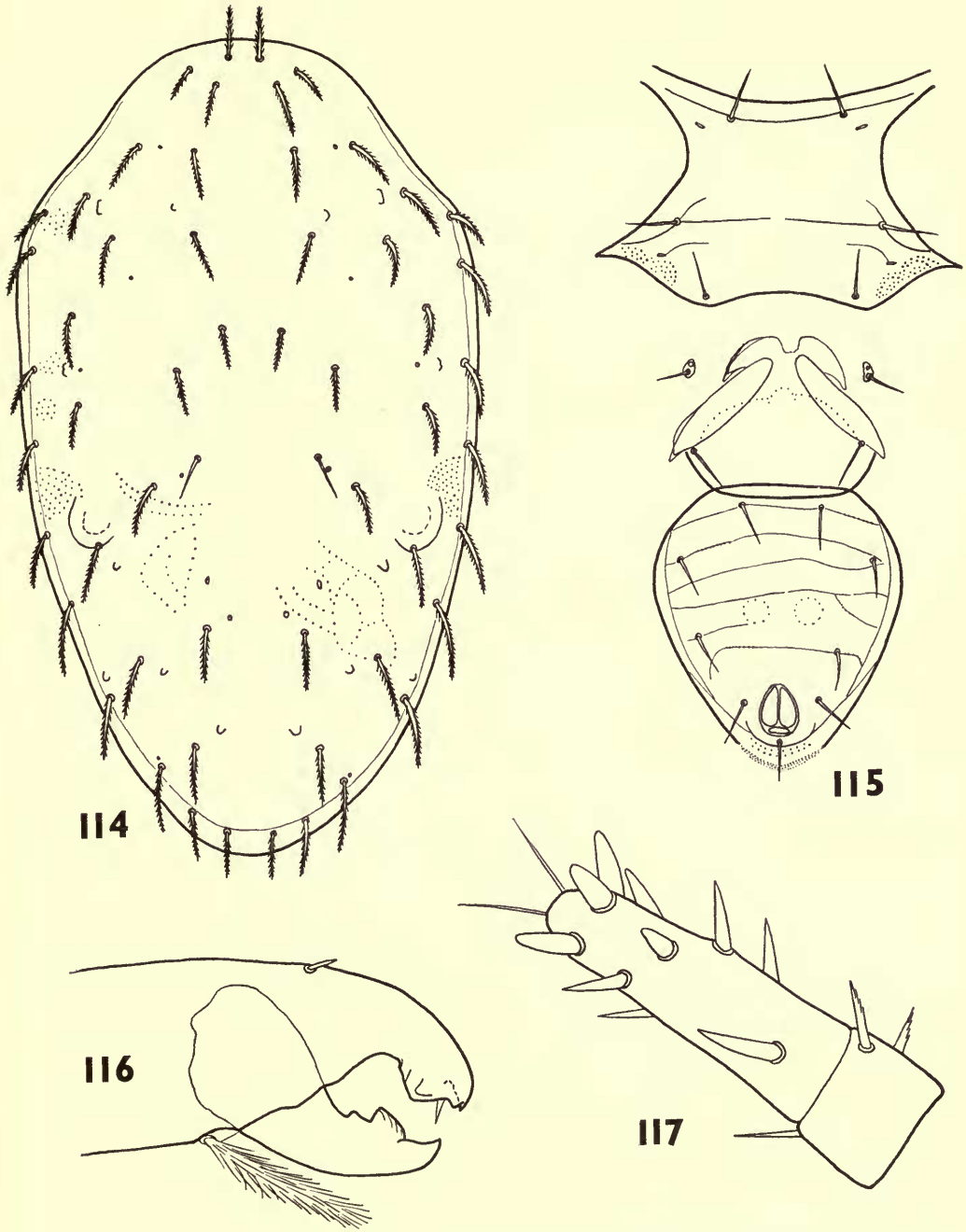
Sternal shield granular. *L.m.t.* absent, *l.arc.* widely recurved, *l.o.p.* short (Text-fig. 119). Genital shield granular, truncated posteriorly. Ventri-anal shield (237 μ long \times 185 μ wide) granular, devoid of any ornamentation and bearing nine simple setae.

The chelicera is shown in Text-fig. 120. The brush-like process of the synarthrodial membrane is half the length of the movable digit. Six rows of deutosternal teeth.

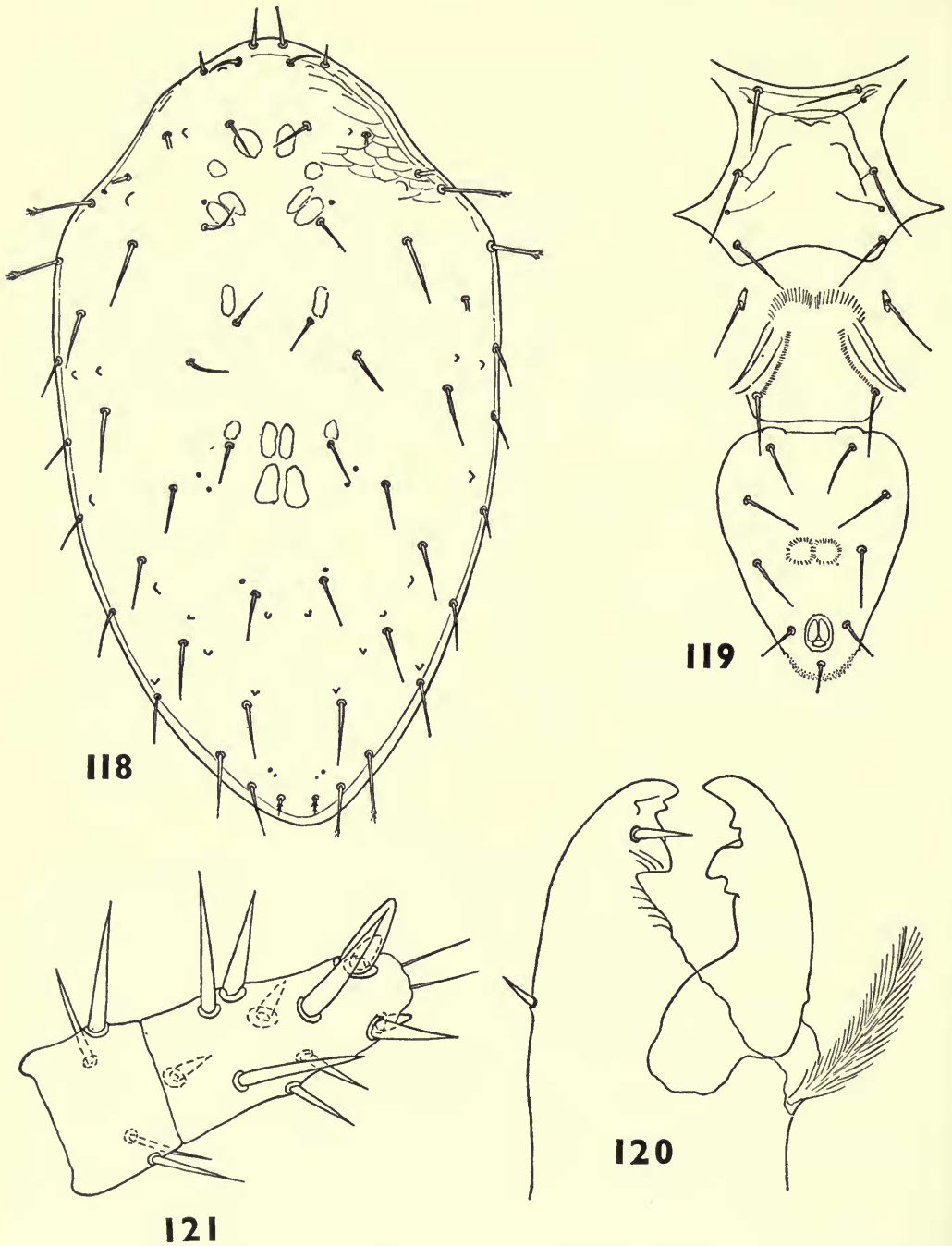
Genus IV with six stout setae all of which are slightly pectinate at their tips. Tarsus II (Text-fig. 121) 128 μ , tibia II 93 μ .

MALE. Unknown.

LOCALITY. A single female (1961.7.14.375) on *Scarabaeus gangeticus* Cast., collected by H. P. Thomasset (1900-122) at Sterkfontein, Transvaal.



FIGS. 114-117. *Macrocheles telamoni* sp. nov., female. Fig. 114, dorsal shield. Fig. 115, ventral shields. Fig. 116, chelicera. Fig. 117, tarsus II.



FIGS. 118-121. *Macrocheles thomasseti* sp. nov., female. Fig. 118, dorsal shield. Fig. 119, ventral shields. Fig. 120, chelicera. Fig. 121, tarsus II.

***Macrocheles transversus* sp. nov.**

FEMALE. Dorsal shield (670μ long \times 425μ wide) with conspicuous transverse reticulations and bearing 28 pairs of setae (Text-fig. 122). The majority of the dorsal setae are simple but certain ones in the r- and S-series may be finely pectinate distally. Setae *ir* are about one and a half diameters apart; J5 are short and pectinate.

Sternal shield broad and with conspicuous ornamentation. *L.m.t.* slightly pro-curved, conspicuous, *l.ang.* joined into one conspicuous line, *l.o.p.* short (Text-fig. 123). Genital shield broad and granular. Ventri-anal shield (260μ long \times 225μ wide) granular and with transverse lines. All setae are simple.

The chelicera is shown in Text-fig. 124. The brush-like process of the synarthrodial membrane is less than half the length of the movable digit. Six rows of deutosternal teeth.

Genu IV with six stout setae. Tarsus II 139μ (Text-fig. 125), tibia II 83μ .

MALE. Unknown.

LOCALITIES. All the material examined is from one species of beetle, *Gymno-pleurus unicolor* Fähr. The holotype female (1961.7.14.237) and three paratypes (1961.7.14.238-240) collected by C. C. Gowdey (1912-462) at Entebbe, Uganda; three paratypes (1961.7.14.241-243) collected by R. Crawshay (1903-350) at Piet Retief, Transvaal; and one paratype (1961.7.14.244) collected by Dr. Smith (1844-6) in South Africa.

***Macrocheles vernalis* (Berlese, 1887)**

Holostaspis vernalis Berlese, A., 1887, *Acari, Myriopoda et Scorpiones, etc.*, Fasc. 45, No. 1.

Macrocheles siculus Oudemans, A. C., 1906, *Ent. Ber.* 2: 7.

FEMALE. Dorsal shield ($700-800\mu$ long \times $400-500\mu$ wide) with reticulations entire, and bearing 28 pairs of setae (Text-fig. 126). All setae simple with a few exceptions: the verticals, *ir*, have their bases in close proximity and are usually pilose distally, and S3, Z3 and J5 are pilose distally. J2 absent.

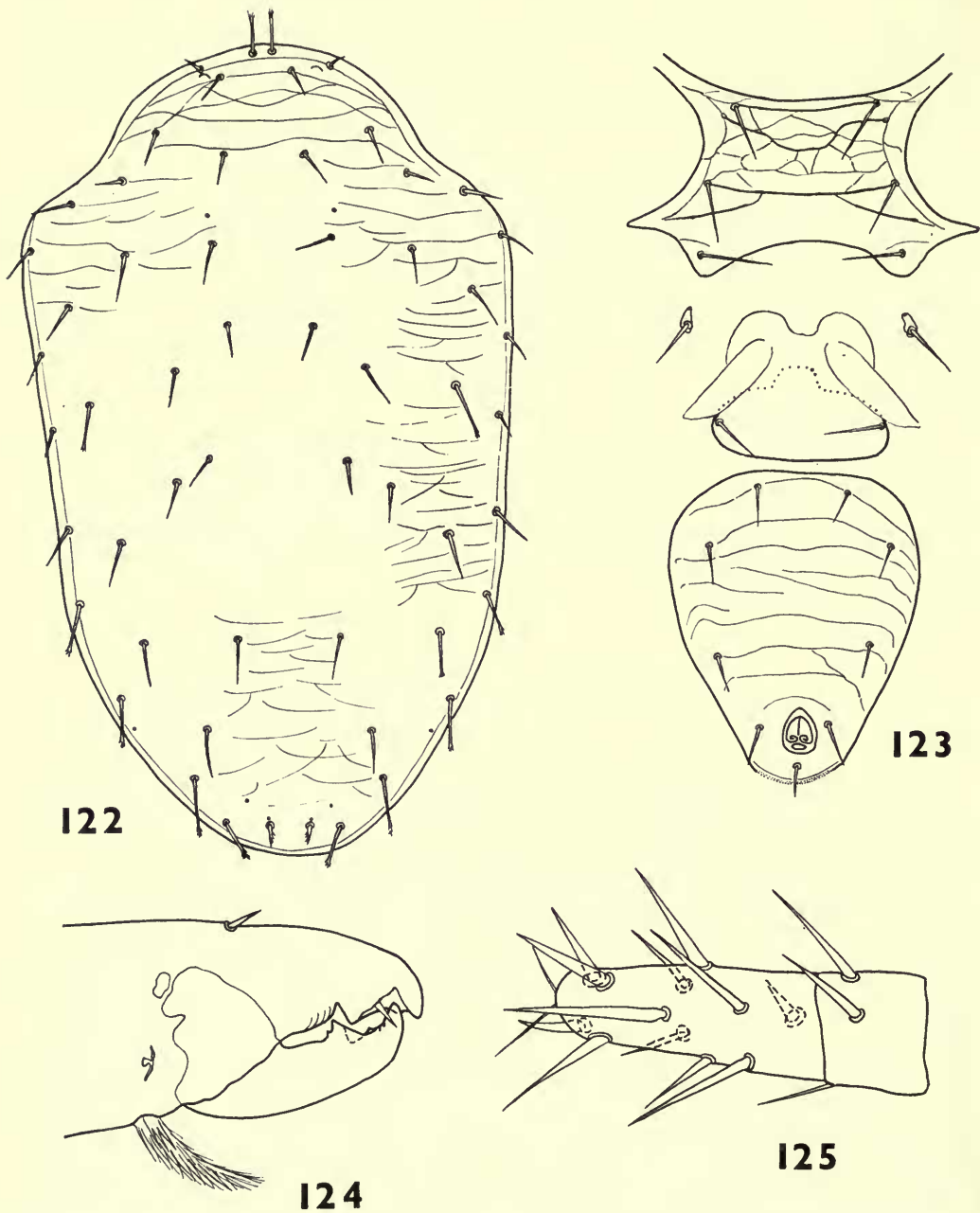
Sternal shield without ornamentation (Text-fig. 127). *L.ang.* short, *l.m.t.* undulating slightly, *l.o.p.* short. Genital shield broad, truncated posteriorly and finely granular. Ventri-anal shield bearing nine simple setae and variable in outline, e.g. in two extreme cases the shield measures 341μ long \times 341μ wide (Text-fig. 128), and 253μ long \times 209μ wide. The shield is granular with recurved transverse lines. The lengths of the setae vary.

The chelicera is shown in Text-fig. 129. The brush-like process of the synarthrodial membrane is short. Six rows of deutosternal teeth.

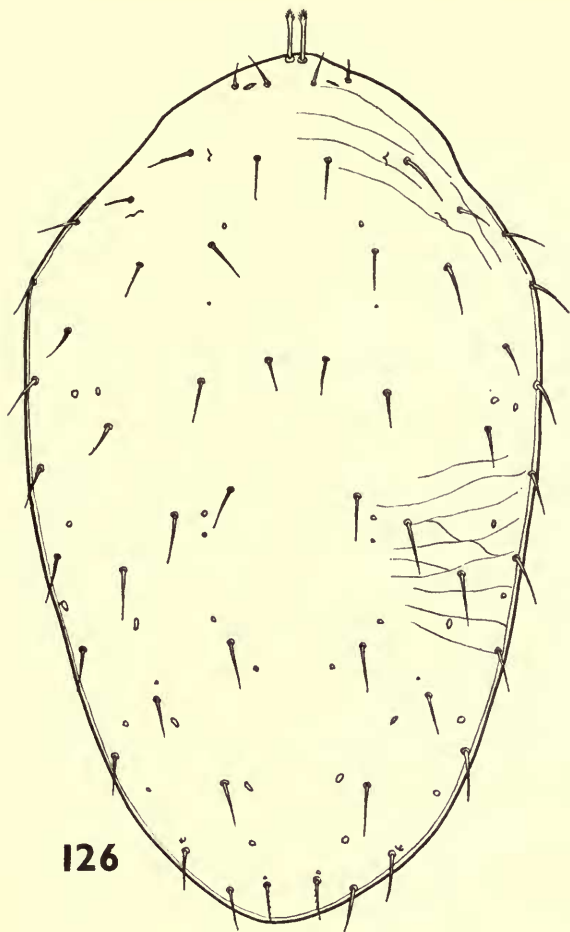
Genu IV with six setae, all of which are stout and simple. Tarsus II 144μ , tibia II 88μ , all aetae simple.

MALE. Unknown.

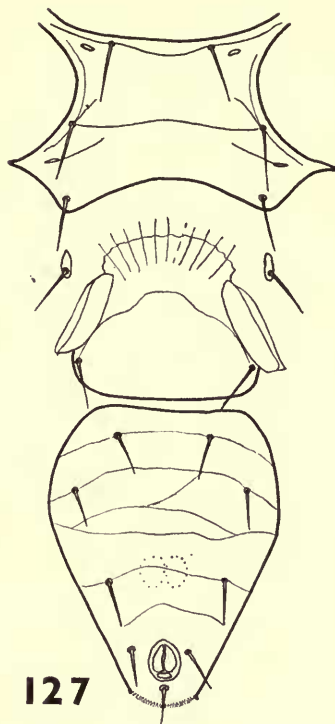
DISTRIBUTION. Berlese (1887) described *Holostaspis vernalis* from *Atheucus semipunctatus* at Venezia, Calabria, southwest Italy, and Oudemans (1906) described *Macrocheles siculus* from *Scarabaeus semipunctatus* at Catanta, Sicily. The Museum collections contain specimens from *Scarabaeus semipunctatus* Fabr. in France; from



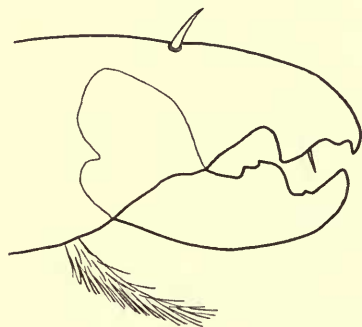
FIGS. 122-125. *Macrocheles transversus* sp. nov., female. Fig. 122, dorsal shield. Fig. 123, ventral shields. Fig. 124, chelicera. Fig. 125, tarsus II.



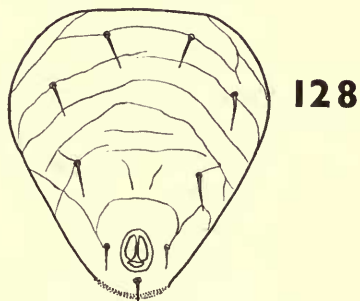
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129



128

FIGS. 126-129. *Macrocheles vernalis* (Berlese), female. Fig. 126, dorsal shield. Fig. 127, ventral shields. Fig. 128, ventri-anal shield. Fig. 129, chelicera.

Scarabaeus sacer L. in France, Romania, Greece, Crete, Turkey, Algeria, Tunisia and China; from *Scarabaeus pius* Illiger in Armenia; from *Scarabaeus puncticollis* Latr. in N. Sinai and the Sahara; from *Scarabaeus gangeticus* Cast. in Aden, Arabia, Liberia, Uganda, Senegal and Nigeria; from *Scarabaeus cristatus* Fabr. in Arabia; from *Scarabaeus carinatus* Gebler in Central Asia; from *Gymnopleurus azureus* Fabr. in Uganda and Angola; from *Gymnopleurus unicolor* Fähr. in Uganda; and from *Gymnopleurus caffer* Fähr. in South Africa.

***Macrocheles verticalis* sp. nov.**

FEMALE. Dorsal shield (910 μ long \times 550 μ wide) partially reticulated, with characteristic small areas of punctations, and with a conspicuous procurved line medially and bearing 28 pairs of setae (Text-fig. 130). The vertical setae, i1, are elliptical with strongly-serrated edges. Setae i3, i4, i5, z2, z3 and J2 are simple, the remainder are bipectinate.

Sternal shield with punctate areas bordering the *liniae*. *L.m.t.* slightly procurved, *l.arc.* strongly recurved, discontinuous anteriorly, *l.o.p.* reaching a third across the shield (Text-fig. 131). Genital shield broad, truncated posteriorly and with only slight ornamentation. Ventri-anal shield (290 μ long \times 205 μ wide) slightly ovoid with punctate transverse lines. The post-anal seta is pilose distally, the remaining eight are simple.

The chelicera is shown in Text-fig. 132. The brush-like process of the synarthrodial membrane is short. Six rows of deutosternal teeth.

Genu IV with six stout strongly bipectinate setae. Tarsus II 205 μ (Text-fig. 133), tibia II 100 μ . Many of the setae on legs II-IV are bipectinate.

MALE. Unknown.

LOCALITY. A single female (1961.7.14.28) on *Pinotus carolinus* L. from El Zumbador, collected by the Biologia Centrali Americana expedition (1886-90).

MITIS-group

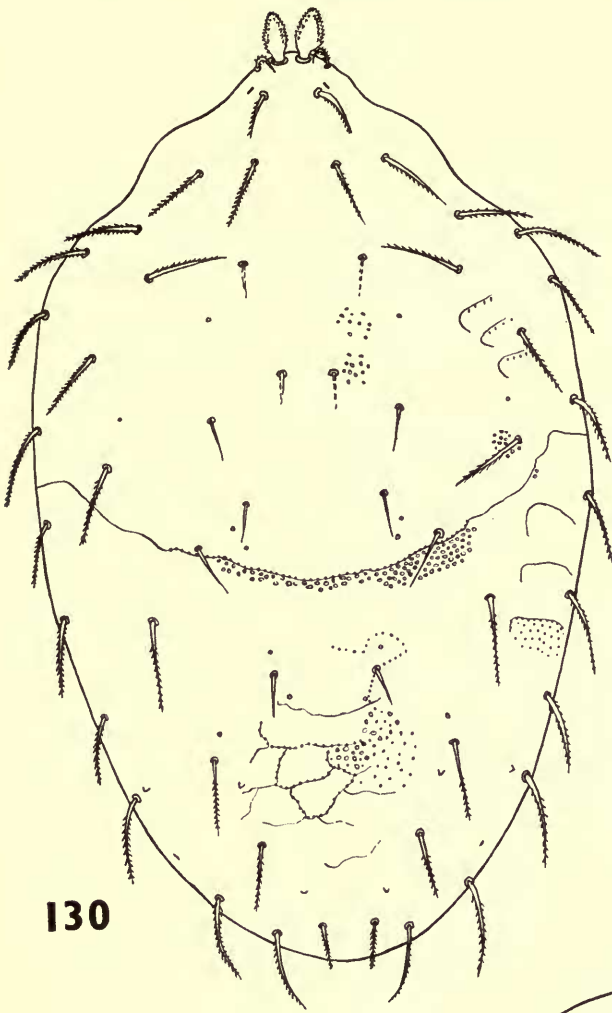
***Macrocheles amygdaligera* (Berlese), 1918**

Holocaeleno (sic.) amygdaligera Berlese, A., 1918, *Redia* 13: 177.

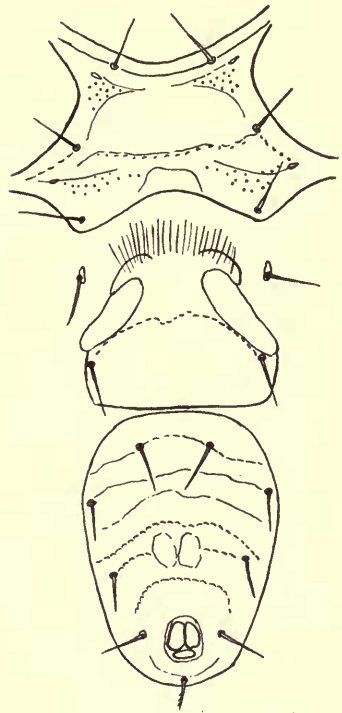
FEMALE. Dorsal shield (650 μ long \times 410 μ wide) with small scattered areas of reticulations, faint transverse lines antero-laterally, and bearing 29 pairs of setae (Text-fig. 134). Setae i1, the verticals, are stout and thorn-like, r4 are the longest (c. 65 μ) and all are simple with the exception of the finely pilose J5. J2 present.

Sternal shield finely granular, posterior margin strongly concave (Text-fig. 135). *L.m.t.* strongly procurved, *l.arc.* strongly recurved, continuous in some specimens, broken in others. Genital shield truncated posteriorly, finely granular. Ventri-anal shield (225 μ long \times 185 μ wide) ovoid, finely granular and with transverse lines in the anterior half. The paranals are the longest of the nine ventri-anal setae.

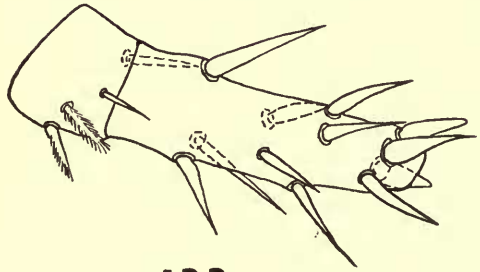
The chelicera is shown in Text-fig. 136. The brush-like process of the synarthrodial membrane is one and a half times as long as the movable digit. Six rows of deutosternal teeth.



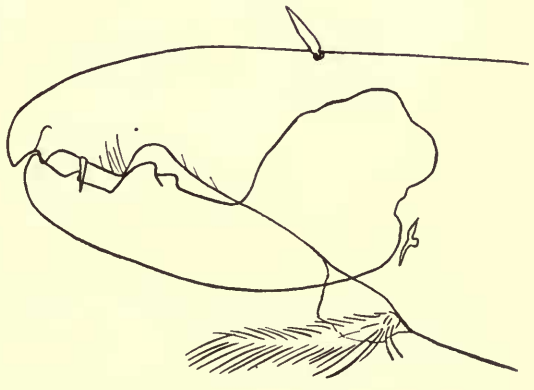
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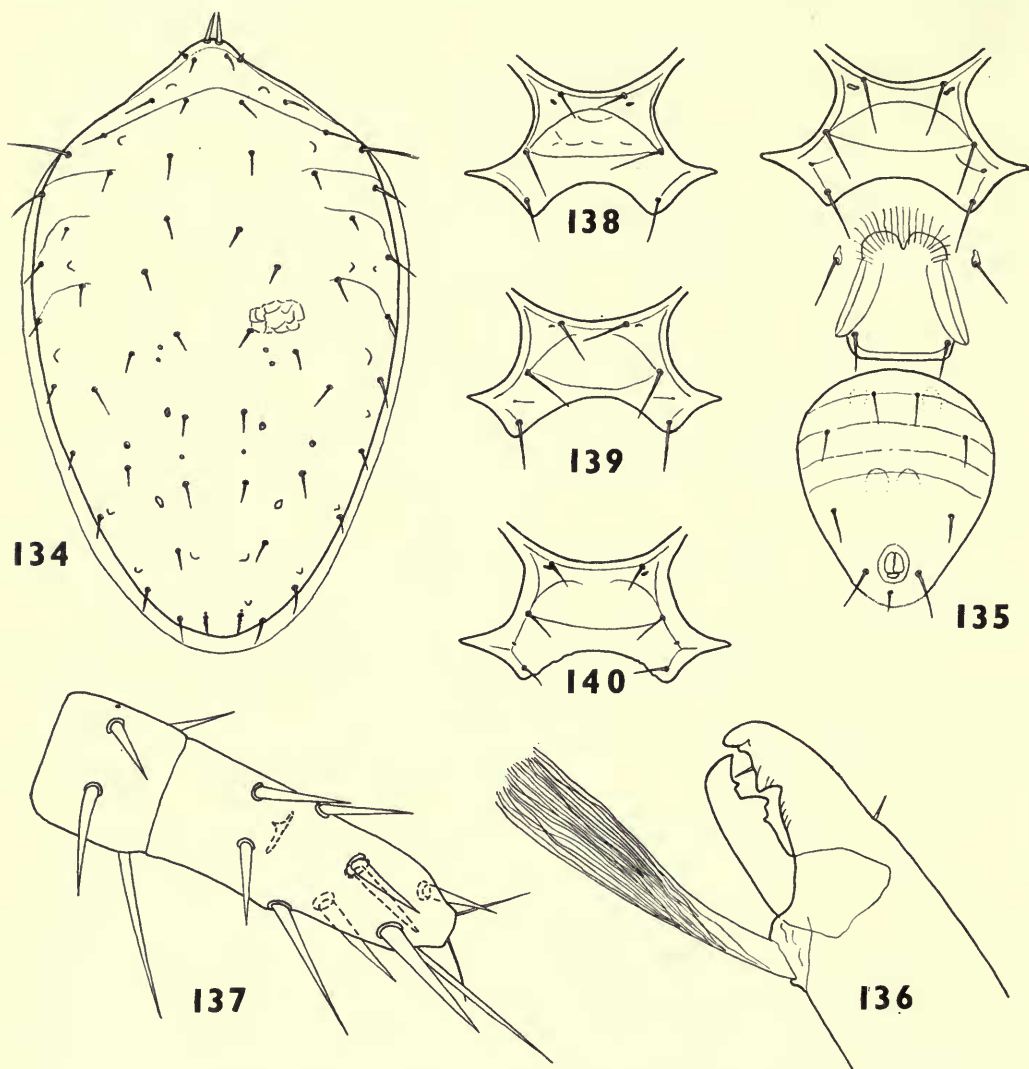


132

FIGS. 130-133. *Macrocheles verticalis* sp. nov., female. Fig. 130, dorsal shield. Fig. 131, ventral shields. Fig. 132, chelicera. Fig. 133, tarsus II.

Genus IV with seven stout setae, of which the dorsal series is slightly pilose, remaining three simple. Tarsus II 125μ (Text-fig. 137), tibia II 95μ .

There is considerable variation in the ornamentation and outline of the sternal

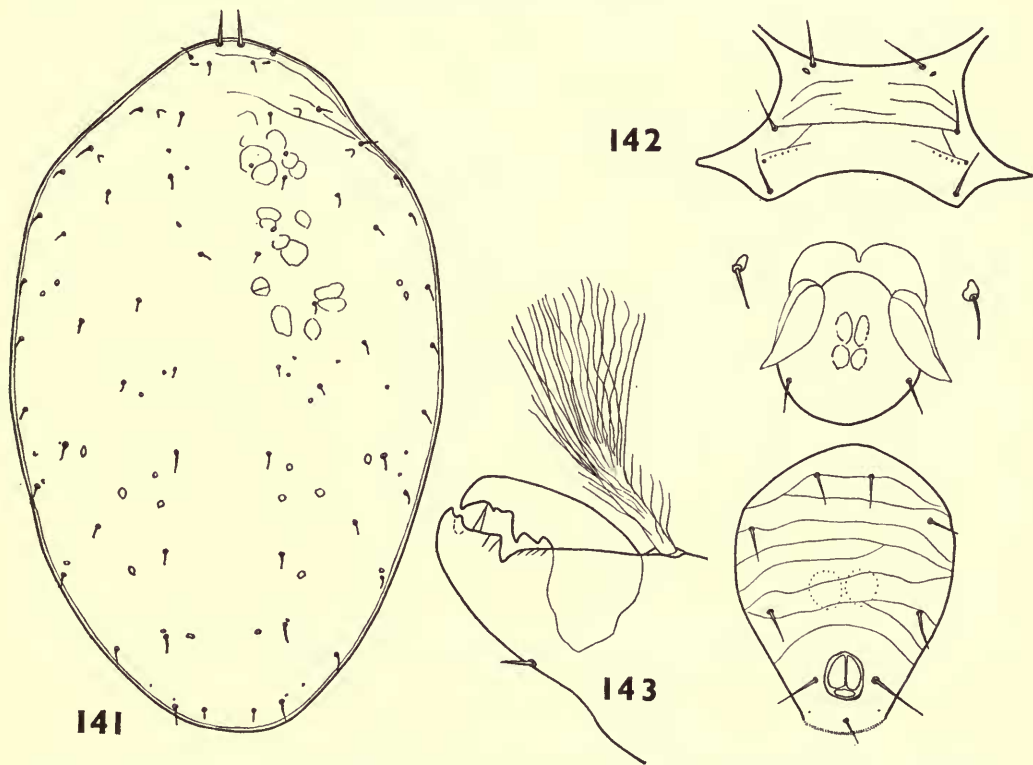


FIGS. 134-140. *Macrocheles amygdaligera* (Berlese), female. Fig. 134, dorsal shield. Fig. 135, ventral shields. Fig. 136, chelicera. Fig. 137, tarsus II. Figs. 138-140, sternal shields.

shield (Text-figs. 138-140), and in the outline and measurement of the ventri-anal shield.

MALE. This sex is described by Berlese (1918): we have not examined fresh material.

DISTRIBUTION. Berlese (*loc. cit.*) examined many specimens of both sexes on *Phanaeus splendidulus* Fabr. from Buenos Aires, Argentina. The present collection contains many females on *Phanaeus imperator* Chev., *Phanaeus horus* Waterh. and *Phanaeus menelas* Cast. in Argentina; on *Phanaeus lancifer* L. in British and French Guiana; on *Phanaeus amethystinus* Harold in Guatemala; on *Phanaeus faunus* Fabr. in the Lower Amazons; on *Phanaeus telamon* Erichs. in Panama; on *Phanaeus bonariensis* Gory, *Phanaeus palaeno* Blanch. and *Phanaeus ensifer* Germ. in Paraguay; on *Phanaeus igneus* McLeay in South Carolina; on *Phanaeus sulcatus* Drury in Jamaica; and on *Phanaeus lancifer* labelled "S. America".



FIGS. 141-143. *Macrocheles dubius* sp. nov., female. Fig. 141, dorsal shield. Fig. 142, ventral shields. Fig. 143, chelicera.

Macrocheles dubius sp. nov.

FEMALE. Dorsal shield (1,111 μ long \times 726 μ wide) finely granular with a few small scattered areas of reticulation, conspicuous pores, and bearing 29 pairs of setae (Text-fig. 141). The verticals, 11, are slender and thorn-like, their bases about two diameters apart. J5 are slightly palmate, the remaining setae fine and simple. Setae J2 present.

Sternal shield granular, faint traces of reticulation (Text-fig. 142). *L.m.t.* straight, *L.arc.* strongly recurved, discontinuous anteriorly. Genital shield semicircular

posteriorly, finely granular, four circular areas medially. Ventri-anal shield ovoid, finely granular, anterior margin strongly convex, conspicuous transverse lines. The paranal setae are the longest of the nine ventri-anal setae.

The chelicera is shown in Text-fig. 143. The brush of setae on the synarthrodial membrane is one and a half times as long as the movable digit. Six rows of deutosternal teeth.

Genu IV with seven stout simple setae. Tarsus II 202μ , tibia II 152μ .

MALE. Unknown.

LOCALITY. The holotype female (1961.7.14.3) and five paratypes (1961.7.14.4-8) on *Phanaeus splendidulus* Fabr. from Argentina, bearing labels of the Fry collection (1905-100) and Col. Taylor (1906-199).

Macrocheles floridanus sp. nov.

FEMALE. Dorsal shield (415μ long \times 280μ wide) irregular in outline, weakly sclerotized with very conspicuous pores, and with 27 pairs of setae (Text-fig. 144). Setae s2 and i2 missing in the unique specimen. There is an extra unpaired seta posterior to left i5. J2 present. Setae i1 are thorn-like and J5 slightly pilose; the remainder are simple with S4 and S5 the longest (c. 21μ), the remainder are very short (up to 9μ).

Sternal shield finely granular. *L.m.t.* apparently absent, *l.arc.* strongly recurved, continuous (Text-fig. 145). Genital shield flask-shaped, almost semicircular posteriorly, granular. Ventri-anal shield (110μ long \times 90μ wide) ovoid with a slight concavity on the left margin, and bearing only seven simple setae.

The chelicera is shown in Text-fig. 146. The brush of setae on the synarthrodial membrane is almost twice the length of the movable digit. Six rows of deutosternal teeth.

Genu IV with seven simple setae. Tarsus II (Text-fig. 147) 88μ , tibia II 63μ .

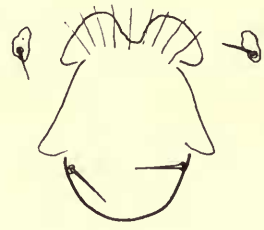
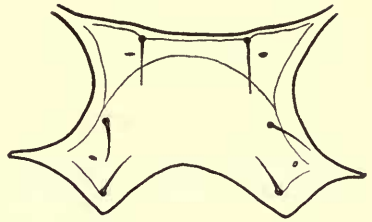
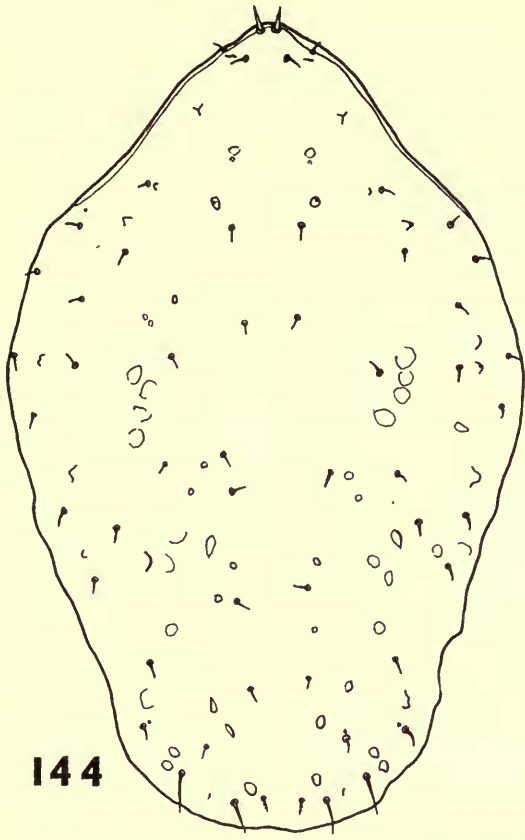
MALE. Unknown.

LOCALITY. A single female (1961.7.14.54) on *Deltochilum orbiculare* Lansb., collected in 1931 by G. Klug at SE. Columbia, Florida, U.S.A.

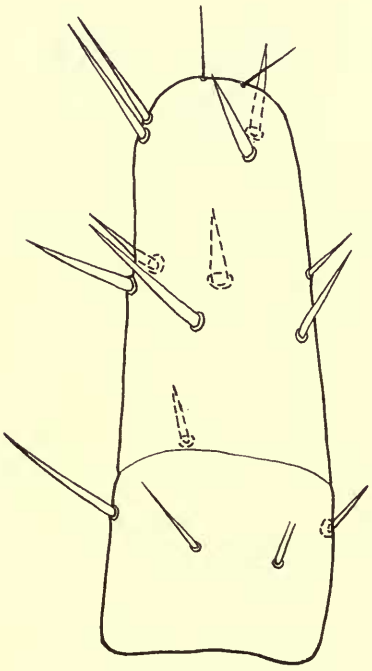
Macrocheles grandis sp. nov.

FEMALE. Dorsal shield (930μ long \times 620μ wide) with only a few areas of faint reticulation and bearing 29 pairs of setae (Text-fig. 148). Verticals, i1, stout and simple, their bases two diameters apart; setae i4, i5, z2, z3, J2, J3 and J5 short (c. $18-25\mu$), simple and fine; remaining setae longer (up to 135μ) and sparsely pilose.

Sternal shield finely granular, posterior margin strongly concave (Text-fig. 149). *L.m.t.* straight, pronounced, *l.arc.* strongly recurved, discontinuous anteriorly. Genital shield slightly concave posteriorly, granular. Ventri-anal shield (310μ long



145



147

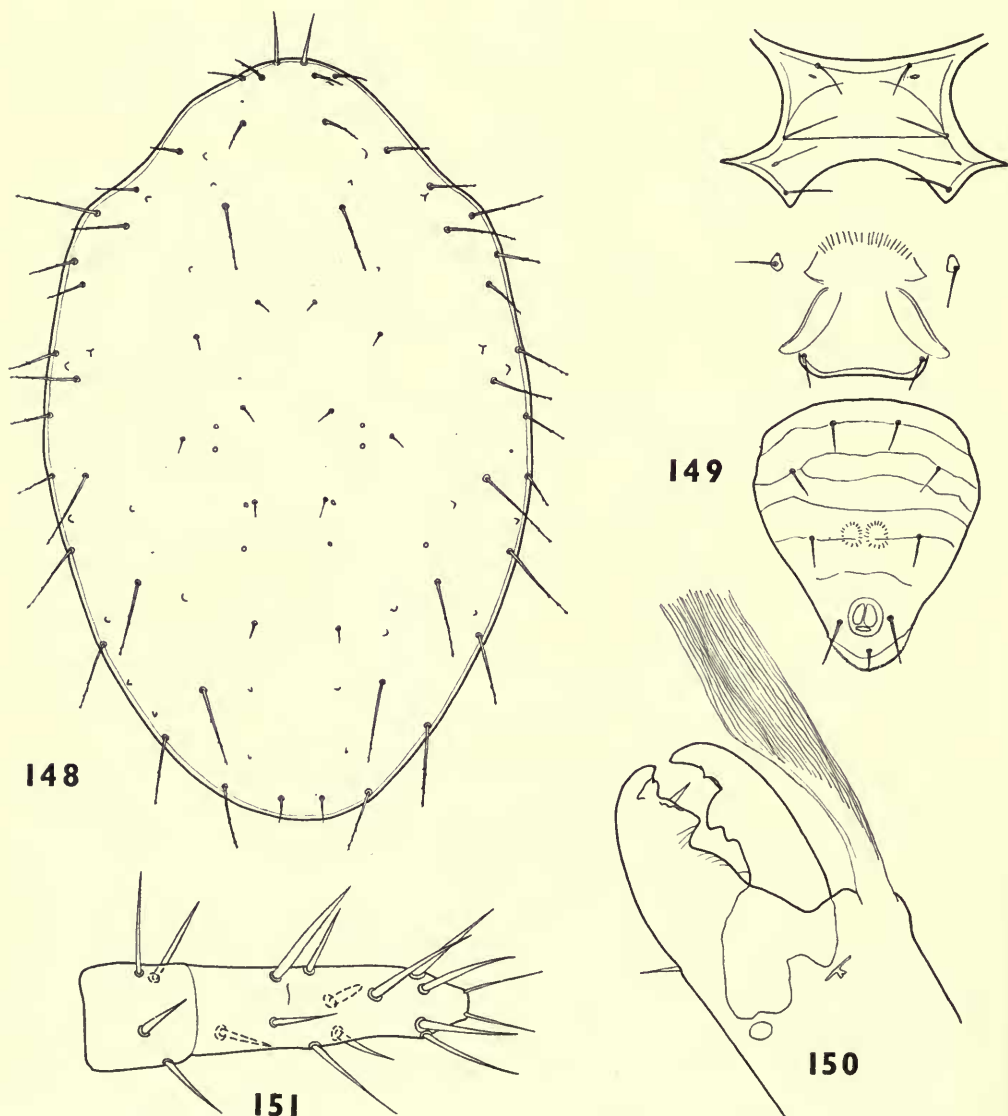


146

$\times 235\mu$ wide) granular, with transverse reticulations. The paranals are the longest of the nine ventri-anal setae.

The chelicera is shown in Text-fig. 150. The brush of setae on the synarthrodial membrane is one and a half times as long as the movable digit. Six rows of deuto-sternal teeth.

Genu IV with seven stout setae; ad_1 is conspicuously long and slightly pilose, remainder simple. Tarsus II 203μ (Text-fig. 151), tibia II 130μ .



FIGS. 148-151. *Macrocheles grandis* sp. nov., female. Fig. 148, dorsal shield. Fig. 149, ventral shields. Fig. 150, chelicera. Fig. 151, Tarsus II.

MALE. Unknown.

LOCALITY. The holotype female (1961.7.14.29) and one paratype (1961.7.14.30) on *Deltochilum lobipes* Bates, purchased from Dyson (1845-123) and collected at Honduras.

Macrocheles phanaei Berlese, 1916

Holocaeleno (sic.) *mitis* Berl. var. *phanaei* Berlese, A., 1916, *Redia* 12: 154.

FEMALE. Dorsal shield (473 μ long \times 308 μ wide) with 29 pairs of setae and conspicuous pores, granular and with pronounced transverse lines anteriorly (Text-fig. 152). The verticals, *iv*, are stout and spinose, all other setae are very short (c. 10 μ) and simple. *J*₂ present.

Sternal shield broad, strongly granular, posterior margin concave (Text-fig. 153). *L.m.t.* distinct, only slightly concave, *l.arc.* arising from the lateral margin of the shield, discontinuous. Ventri-anal shield (165 μ long \times 154 μ wide) finely granular, reticulated and bearing nine simple setae of which the paranals are the longest.

The chelicera is shown in Text-fig. 154. The brush of setae on the synarthrodial membrane is almost twice the length of the movable digit. Six rows of deutosternal teeth.

Genu IV with seven simple setae. Tarsus II 88 μ , tibia II 55 μ .

MALE. Unknown.

DISTRIBUTION. The type locality is "super *Phanaeus perspicillatus*; Ecuador". We have examined additional specimens on *Phanaeus splendidulus* F. from Ecuador: one in the Fry collection (1905-100) and three collected by Col. Taylor (1906-199).

Macrocheles scapularis sp. nov.

FEMALE. Dorsal shield (570 μ long \times 370 μ wide) finely granular, completely devoid of all ornamentation and bearing 29 pairs of simple setae (Text-fig. 155). The verticals, *iv*, are thorn-like. With the exception of *r*₄ which are c. 65 μ long, all other dorsal setae are c. 9 μ long. Seta *J*₂ present.

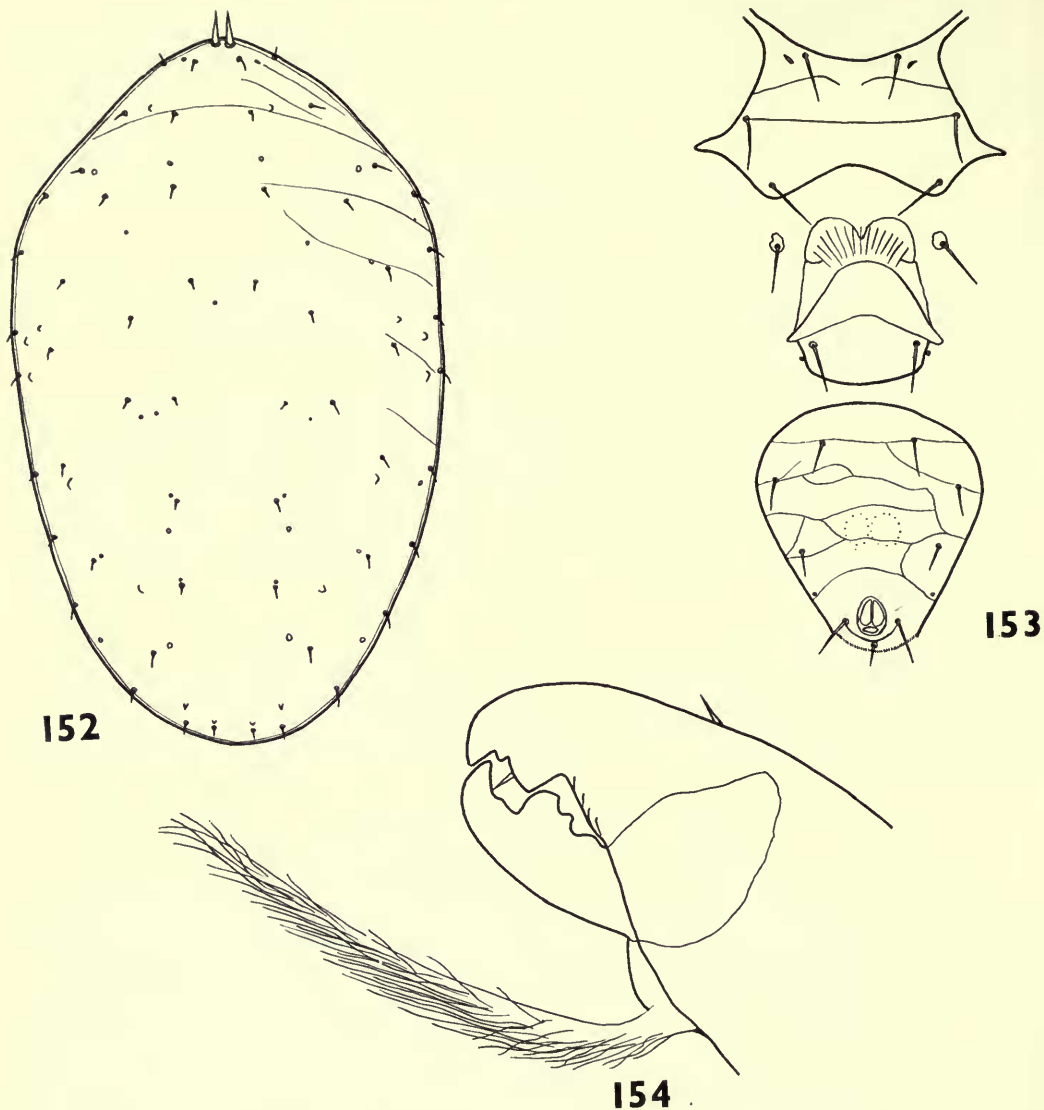
Sternal shield with very fine granulations centrally, becoming coarser towards the margins. Posterior margin strongly concave (Text-fig. 156). *L.m.t.* apparently absent, *l.arc.* strongly recurved, discontinuous anteriorly. Sternal setae long. Genital shield finely granular. Ventri-anal shield (185 μ long \times 155 μ wide) ovoid, granular and devoid of ornamentation and bearing nine simple setae of which the paranals are the longest.

The chelicera is shown in Text-fig. 157. The brush-like process of the synarthrodial membrane is slightly longer than the movable digit. Six rows of deutosternal teeth.

Genu IV with seven simple setae. Tarsus II with very slender setae (Text-fig. 158), 88 μ long, tibia II 65 μ .

MALE. Unknown.

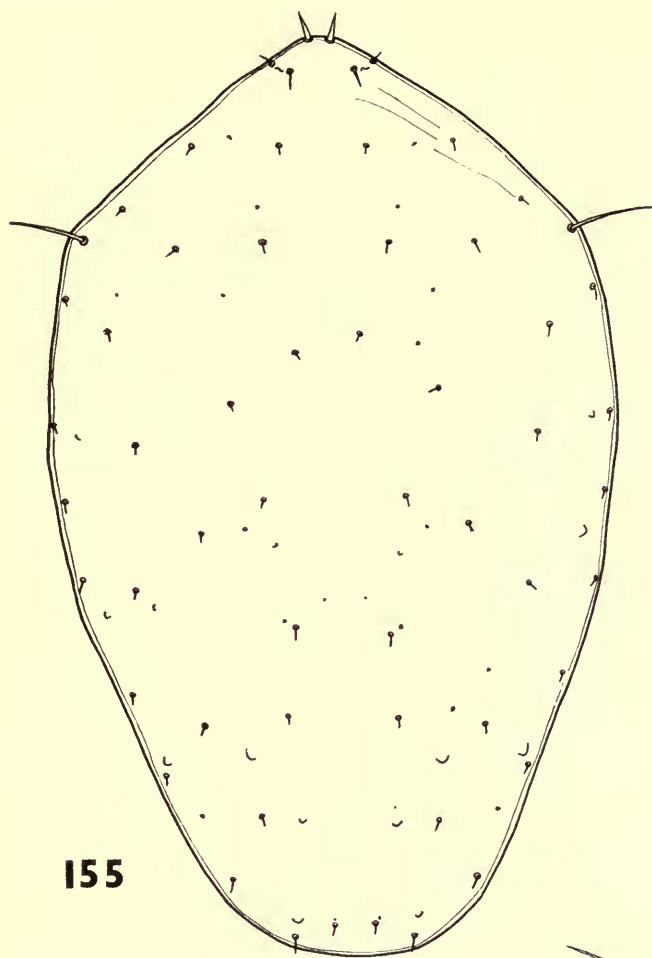
LOCALITY. A single female (1961.7.14.23) on *Deltochilum lobipes* Bates in the Nevinson collection (1918-14) from "North America".



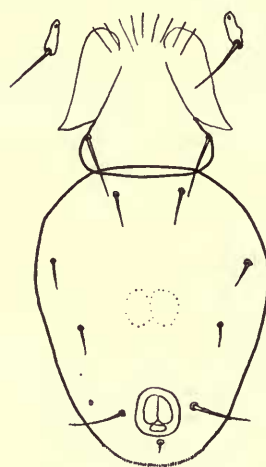
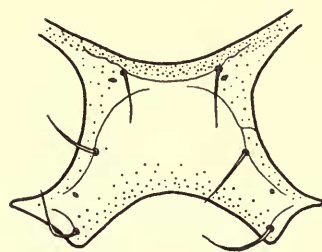
FIGS. 152-154. *Macrocheles phanaei* Berlese, female. Fig. 152, dorsal shield. Fig. 153, ventral shields. Fig. 154, chelicera.

***Macrocheles turki* sp. nov.**

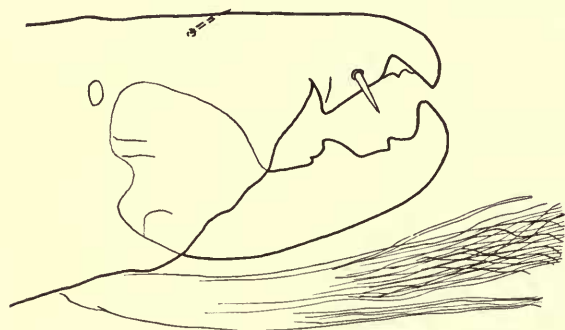
FEMALE. Dorsal shield (620μ long \times 390μ wide) with 29 pairs of setae and conspicuous pores, but the only ornamentation is a few transverse lines anteriorly. Surrounding the dorsal shield posterior to setae r_4 is a broadening sclerotized strip of cuticle (Text-fig. 159). With the exception of J_5 , which are short and palmate, and ir , which are thorn-like, all setae are simple and short (c. 15μ). J_2 present.



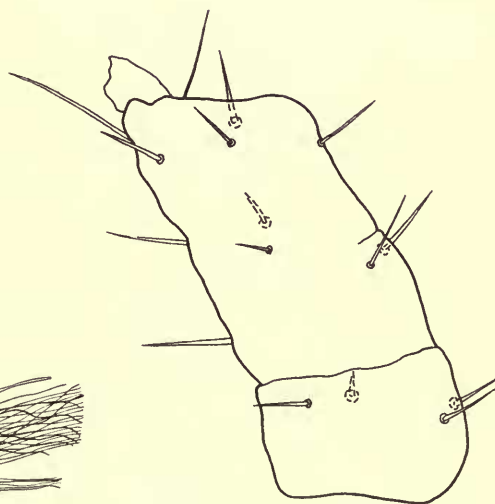
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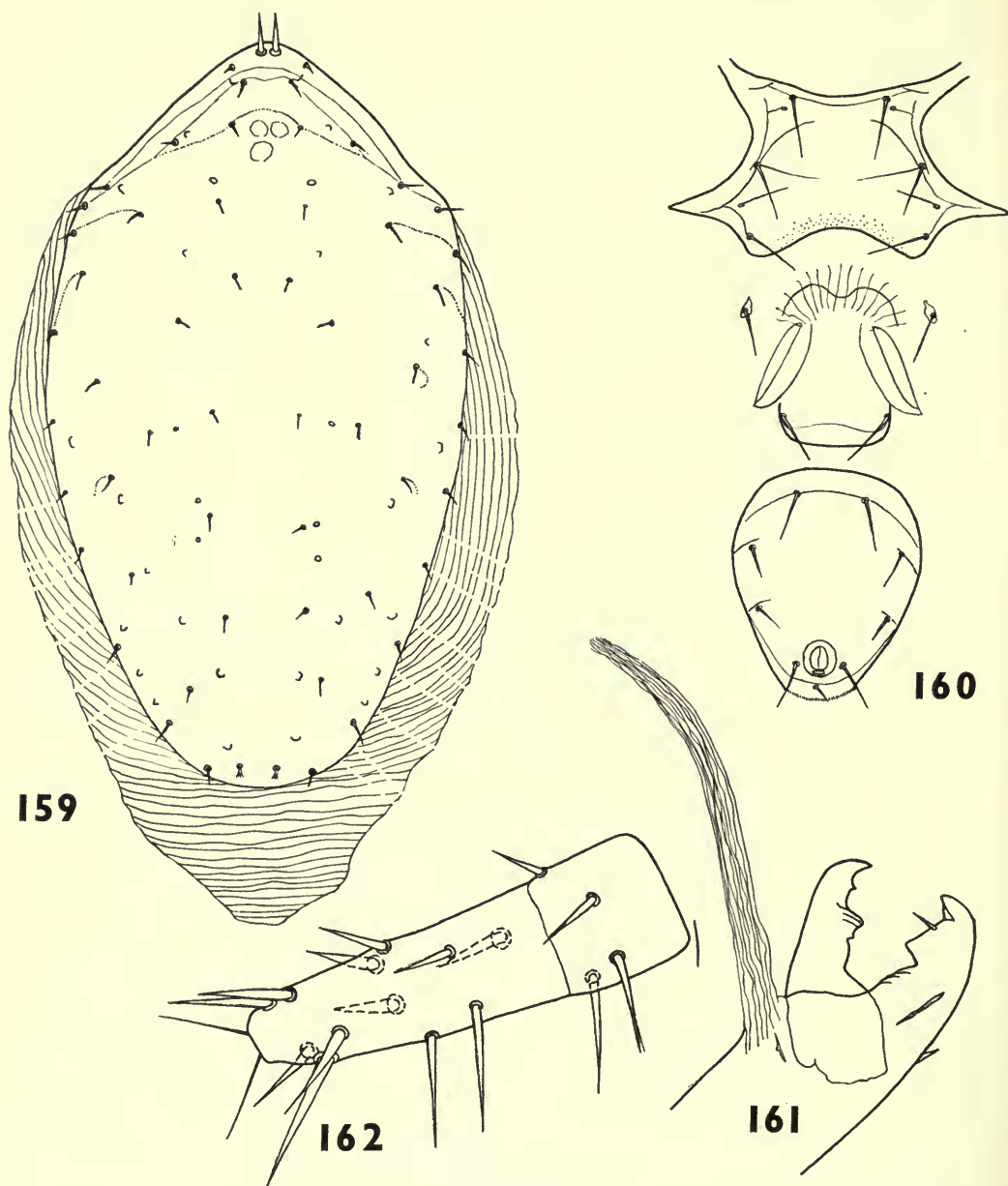


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FIGS. 155-158. *Macrocheles scapularis* sp. nov., female. Fig. 155, dorsal shield. Fig. 156, ventral shields. Fig. 157, chelicera. Fig. 158, tarsus II.



FIGS. 159-162. *Macrocheles turki* sp. nov., female. Fig. 159, dorsal shield. Fig. 160, ventral shields. Fig. 161, chelicera. Fig. 162, tarsus II.

Sternal shield finely granular, posterior margin concave (Text-fig. 160). *L.m.t.* slightly procurved, discontinuous medially, *l.arc.* strongly recurved, also discontinuous. Genital shield narrow and granular. Ventri-anal shield (185μ long \times 160μ wide) ovoid, finely granular; the only ornamentation being a faint recurved line anteriorly. The paranals and the anterior pair are the longest of the ventri-anal setae.

The chelicera is shown in Text-fig. 161. The brush of setae on the synarthrodial membrane is twice the length of the movable digit. Six rows of deutosternal teeth.

Genus IV with seven simple setae, *pd*₂ stoutest. Tarsus II (Text-fig. 162) 134μ , tibia II 82μ .

MALE. Unknown.

LOCALITY. The holotype female (1961.7.14.255) and one paratype (1961.7.14.256) on *Phanaeus telamon* Erichs., collected on the Biologia Centrali Americana expedition (1886-90) at Volcan de Chiriqui, Panama.

This species is named after Dr. F. A. Turk.

BREGETOVAE-group

Macrocheles austroamericanus sp. nov.

FEMALE. Dorsal shield (950μ long \times 540μ wide) finely granular, with very faint areas of reticulation, and bearing 29 pairs of setae (Text-fig. 163). Setae 11 are simple but all the other setae are pilose to a certain degree, viz.: 11 are pilose on their outer margins only, 14, 15, 22, 23, J2 and J3 are scarcely pilose, whereas the remainder are more markedly so.

Sternal shield granular, coarsely along the concave posterior margin (Text-fig. 164). *L.m.t.* almost straight, slight undulation, *l.arc.* strongly recurved, short on each side, *l.o.p.* curving up to meet *l.m.t.* Genital shield granular, truncated posteriorly. Ventri-anal shield (330μ long \times 225μ wide) narrow, slightly concave sides and with transverse lines.

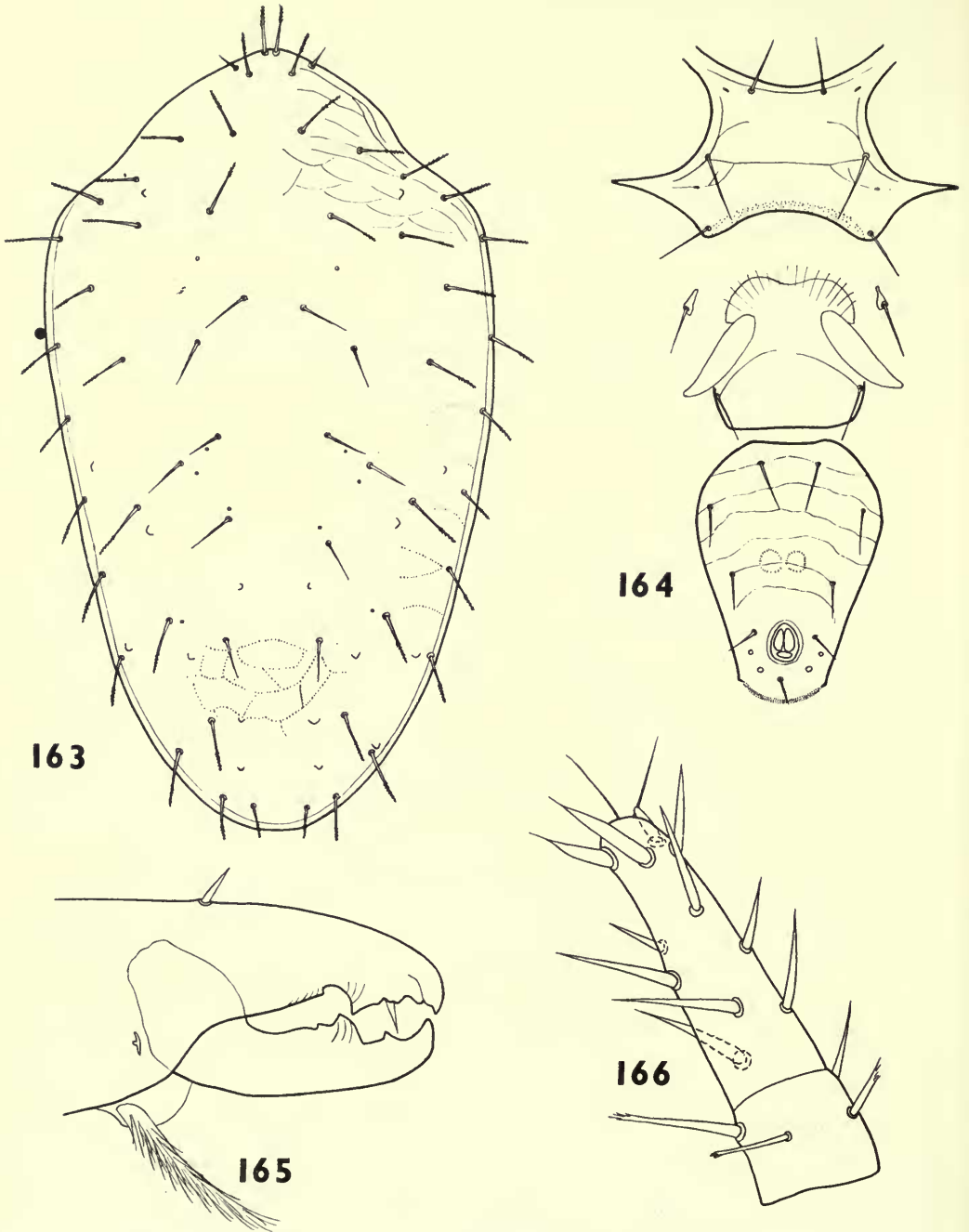
The chelicera is shown in Text-fig. 165. The brush of setae-like processes on the synarthrodial membrane is short. Six rows of deutosternal teeth.

Genus IV with six stout setae, all of which are pilose. Tarsus II 202μ (Text-fig. 166), tibia II 126μ .

MALE. Unknown.

LOCALITIES. The holotype female (1961.7.14.31) and over a dozen paratypes (1961.7.14.32-42) on *Phanaeus imperator* Chev. from Nanahua, Paraguayan Chaco, Paraguay, collected by G. S. Carter (1928-50); and further paratypes from: *Ontherus sulcator* Fabr., Rio Salado, Argentina; *Chalcocopris hesperus* Oliv., Rio de Janeiro, Brazil; *Phanaeus kirbyi* Vigors, Chapada, central Brazil; *Phanaeus lancifer* L., Essequibo River, Moraballi Creek, British Guiana; *Phanaeus scintillans* Bates, Temascaltapac, Mexico; and *Phanaeus telamon* Erichs., also from Mexico.

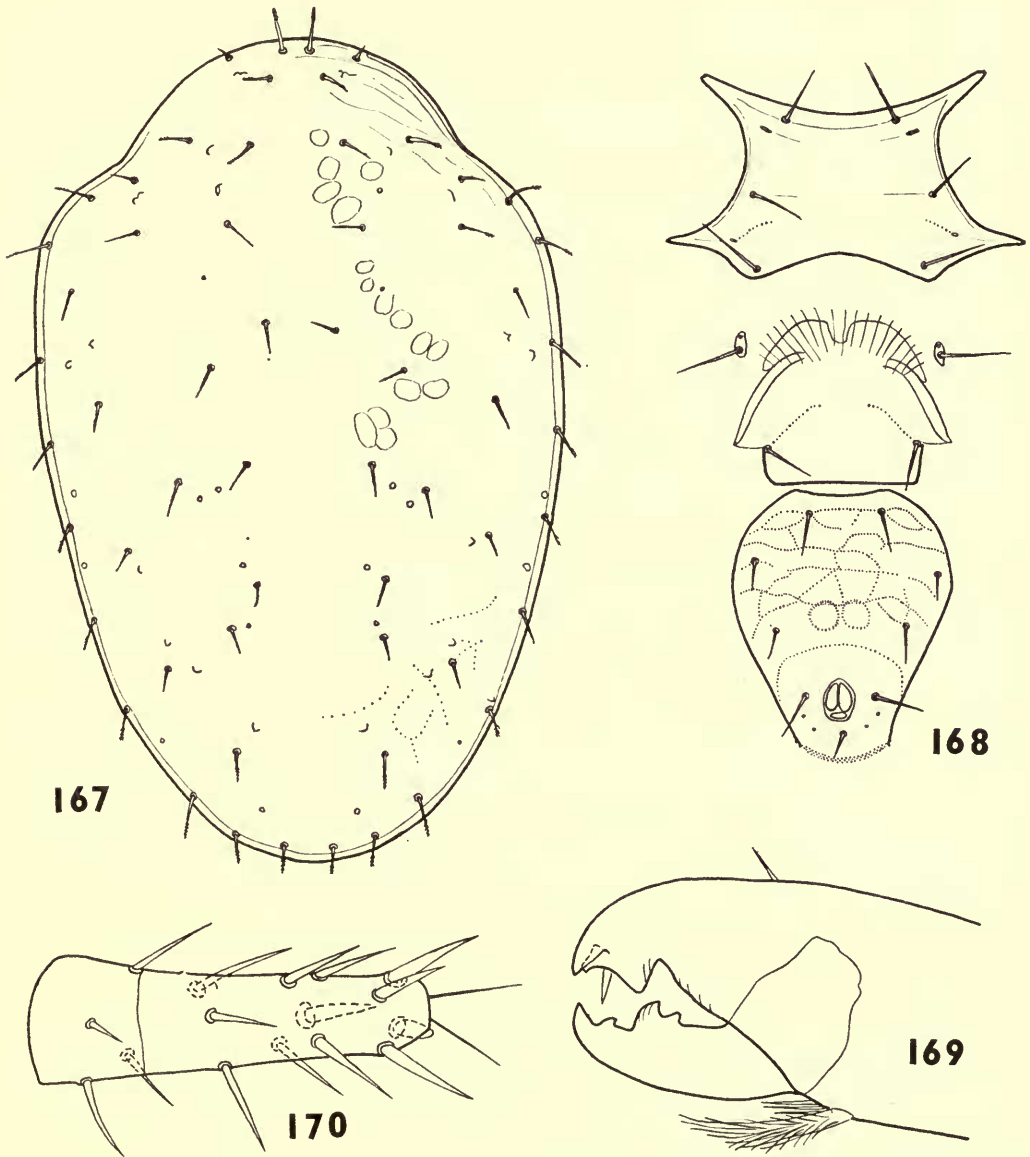
This species appears to be closely related to *Macrocheles cordiger* (Berlese, 1888) and to *M. spinosus* Berl., 1918, but differs in the form and chaetotaxy of the dorsal shield.



FIGS. 163-166. *Macrocheles austroamericanus* sp. nov., female. Fig. 163, dorsal shield. Fig. 164, ventral shields. Fig. 165, chelicera. Fig. 166, tarsus II.

Macrocheles brasiliensis sp. nov.

FEMALE. Dorsal shield (880 μ long \times 540 μ wide) with only very faint traces of granulation, and bearing 29 pairs of setae (Text-fig. 167). Setae r1, r3, s5, i4, i5, z2, z3, Z1, Z2, J2 and J3 are simple, the remainder are finely pilose distally on one or both margins. The verticals, i1, are separated by twice the diameter of their bases.



FIGS. 167-170. *Macrocheles brasiliensis* sp. nov., female. Fig. 167, dorsal shield. Fig. 168, ventral shields. Fig. 169, chelicera. Fig. 170, tarsus II.

Sternal shield granular, *l.m.t.* incomplete, *l.ang.* and *l.o.p.* very short (Text-fig. 168). Genital shield broad, truncated posteriorly. Ventri-anal shield (280μ long \times 240μ wide) slightly concave anteriorly, granular, and with fine punctate transverse lines. The nine setae are simple.

The chelicera is shown in Text-fig. 169. The brush-like process of the synarthrodial membrane is short. Six rows of deutosternal teeth.

Genus IV with seven setae all of which are finely pilose distally. Tarsus II (Text-fig. 170) 185μ , tibia II 125μ .

MALE. Unknown.

LOCALITY. The holotype female (1961.7.14.245) and one paratype (1961.7.14.246) on *Phanaeus bellicosus* Oliv. in the Nevinson collection (1918-14) from Sta. Catherina, Brazil.

Macrocheles bregetovae sp. nov.

FEMALE. Dorsal shield ($1,050\mu$ long \times 630μ wide) with faint areas of reticulation around the edges and bearing 29 pairs of setae (Text-fig. 171). Setae 15, 23 and Z1 are simple, the remainder are pilose in at least their distal thirds. The verticals, 11, are separated by a little less than the diameter of their bases. J2 present.

Sternal shield finely granular. *L.m.t.* slightly procurved, *l.arc.* strongly recurved, discontinuous anteriorly (Text-fig. 172). Genital shield broad, truncated posteriorly. Ventri-anal shield (300μ long \times 250μ wide) finely granular, with faint transverse lines. The post-anal seta is shorter than the other eight on the ventri-anal shield and is slightly pectinate terminally: some of the remainder show traces of pectination.

The chelicerae are shown in Text-fig. 173. The setae-like process of the synarthrodial membrane is short. Six rows of deutosternal teeth.

Genus IV with six setae, all of which are strongly pilose in their distal halves. Tarsus II 205μ (Text-fig. 174), tibia II 130μ .

MALE. Unknown.

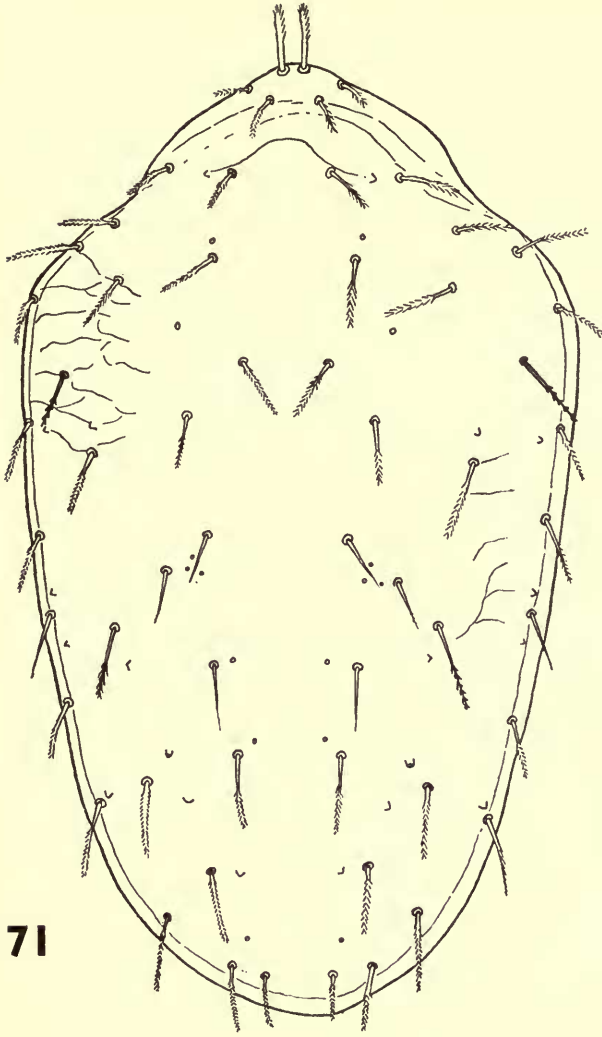
LOCALITIES. The holotype female (1961.7.14.9) and ten paratypes (1961.7.14.10-19) on *Pinotus carolinus* L. from El Zumbador, and one paratype (1961.7.14.21) also on *Pinotus carolinus* from Zapote, all Guatemala, collected by Biologia Centrali Americana (1886-90); one paratype (1961.7.14.20) on *Phanaeus wagneri* Harold from Guatemala; and one paratype (1961.7.14.22) on *Phanaeus bonariensis* Gory from Asuncion, Paraguay, collected by E. G. Kent (1925-262).

This species is named after Dr. Nina Bregtova.

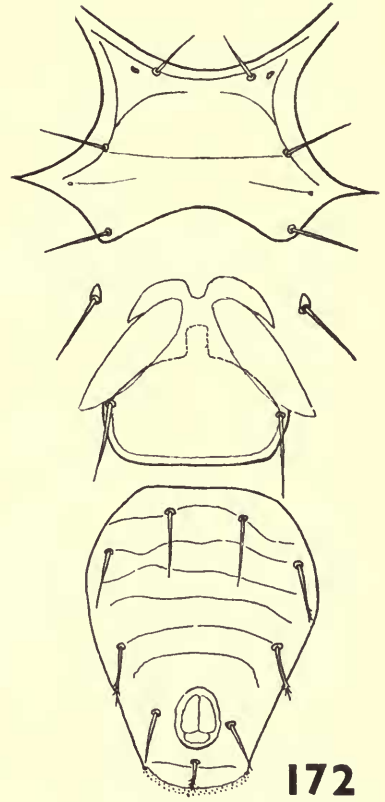
Macrocheles filipponii sp. nov.

FEMALE. Dorsal shield ($1,060\mu$ long \times 670μ wide) with areas of granulation and faint sparse reticulations around the margin (Text-fig. 175). All the 29 pairs of dorsal setae are strongly bipectinate; the verticals, 11, have their bases less than one diameter apart; 11 and J5 are the shortest. The setae on the interscutal membrane surrounding the dorsal shield are also bipectinate. J2 present.

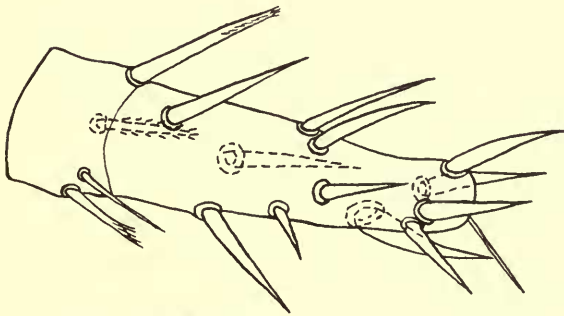
Sternal shield granular, with punctate areas (Text-fig. 176). *L.m.t.* almost straight, *l.arc.* strongly recurved, discontinuous anteriorly. Genital shield broad, truncated



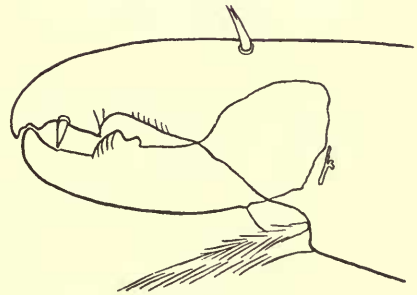
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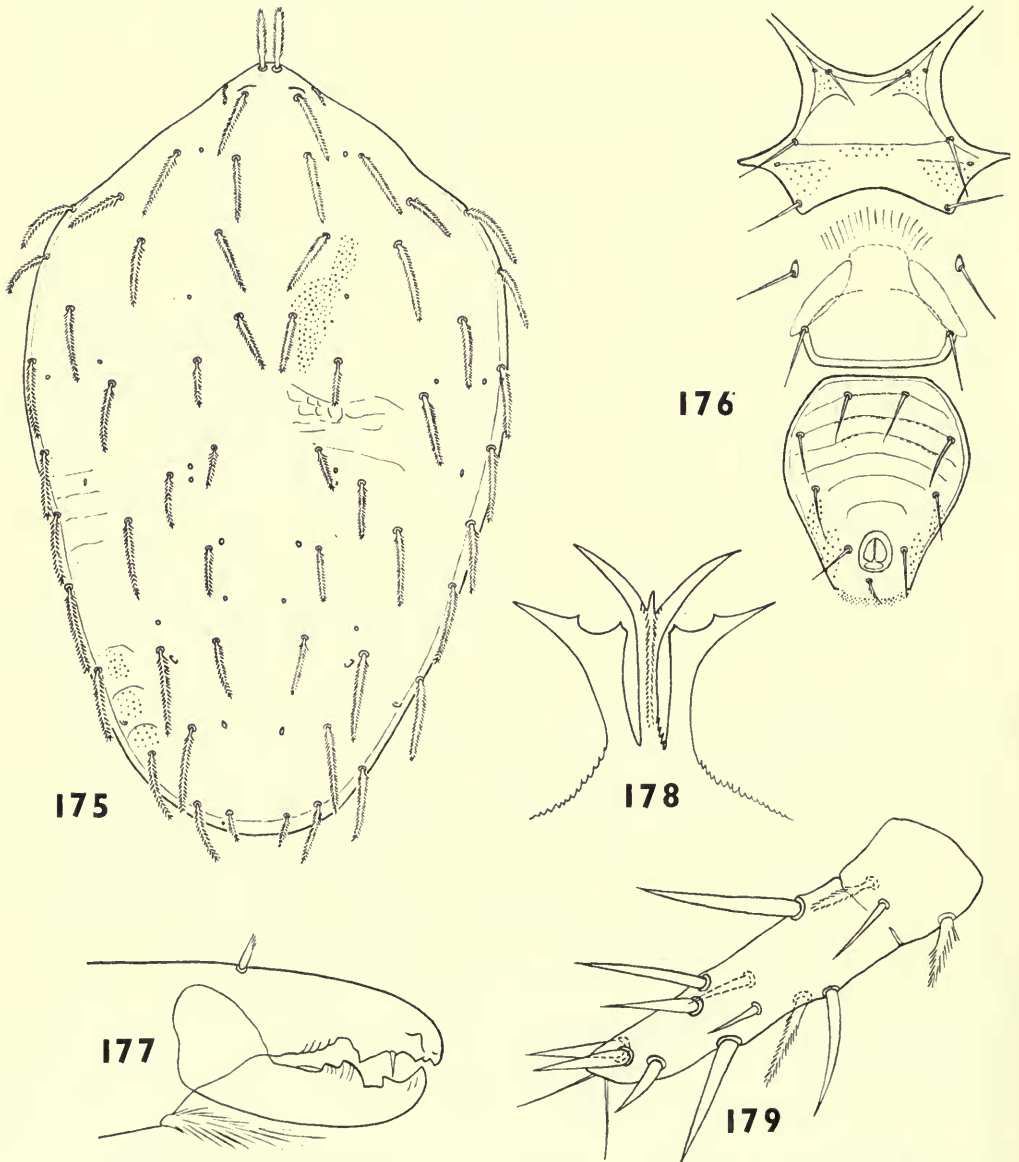


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FIGS. 171-174. *Macrocheles bregetovae* sp. nov., female. Fig. 171, dorsal shield. Fig. 172, ventral shields. Fig. 173, chelicera. Fig. 174, tarsus II.

posteriorly, finely granular. Ventri-anal shield (320μ long \times 270μ wide) with anterior margin straight, finely granular, and with recurved transverse lines bordered with fine areolations. The post-anal seta is slightly pilose and is the shortest of the nine setae on the ventri-anal shield.

The brush-like process of the synarthrodial membrane of the chelicera is short (Text-fig. 177). The tectum is shown in Text-fig. 178. Six rows of deutosternal teeth.



FIGS. 175-179. *Macrocheles filipponii* sp. nov., female. Fig. 175, dorsal shield. Fig. 176, ventral shields. Fig. 177, chelicera. Fig. 178, tectum. Fig. 179, tarsus II.

Chaetotaxy of legs : Leg I : tarsus with very fine simple setae, remaining segments with majority of setae stouter and pectinate. Leg II : tarsus (237μ) with thorn-like setae, some of which are pectinate (Text-fig. 179), tibia (155μ) and remaining segments with most setae pectinate, genu and femur each with a single short broad bipectinate seta dorsally. Leg III with setae less stout than on leg IV, majority pectinate to some degree, femoral setae noticeably stoutest. Genu IV with six strongly pectinate setae, remaining setae mostly pectinate, femur with two stouter setae dorsally.

MALE. Unknown.

LOCALITIES. The holotype female (1961.7.14.1) on *Pinotus carolinus* Fabr. in the Pittier collection (1895-1955) from Costa Rica ; and one paratype (1961.7.14.2) on *Eurysternus claudicans* Kirsch collected by the Biologia Centrali Americana expedition (1886-90) at Coban, Vera Paz, Guatemala.

This species is named after Dr. A. Filipponi.

Macrocheles hirsutissima (Berlese, 1910)

Holostaspella hirsutissima Berlese, A., 1910, *Redia* 6 : 248.

FEMALE. Dorsal shield (940μ long \times 570μ wide) with a characteristic pattern of depressions, ridges and punctations, and bearing 29 pairs of setae (Text-fig. 180). Setae 11 are broad and flat with strongly pectinate margins ; setae 13-15 and 22 are simple or with only occasional pectinations. The remaining setae are all strongly bipectinate and the lateral interscutal membrane bears on each side of the dorsal shield a row of 20 similar setae. There is a band of sclerotized cuticle around the posterior margin of the dorsal shield. J2 present.

Sternal shield well ornamented with reticulations and areolate areas. *L.m.t.* undulated, *l.ang.* recurved (Text-fig. 181). Genital shield truncated posteriorly, slightly concave, and with areolations. Ventri-anal shield (330μ long \times 280μ wide) irregularly ovoid in outline, with punctate transverse lines and areolations especially in the posterior half. The nine setae are simple.

The chelicera is shown in Text-fig. 182. The chelical brush is short. Six rows of deutosternal teeth.

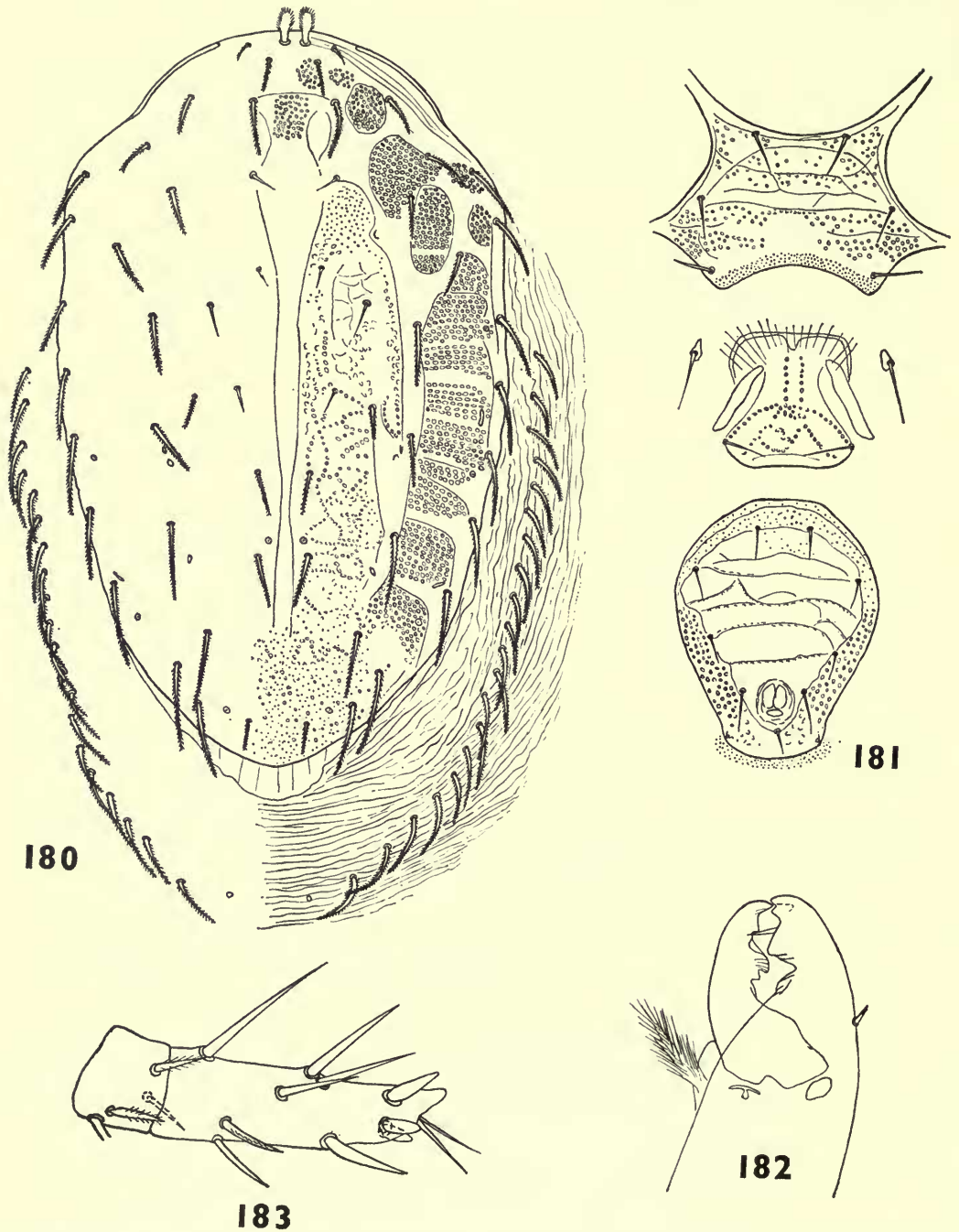
Genu IV with seven setae which, although damaged in the only specimen we have, appear to be pilose distally. Tarsus II 185μ (Text-fig. 183), tibia II 145μ .

MALE. Unknown.

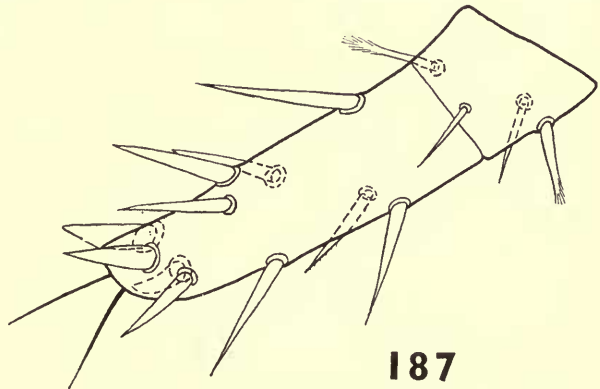
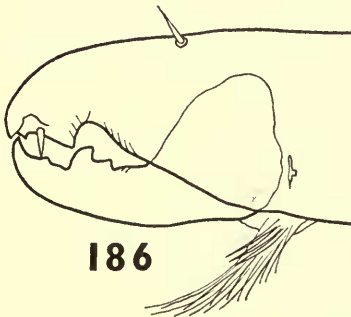
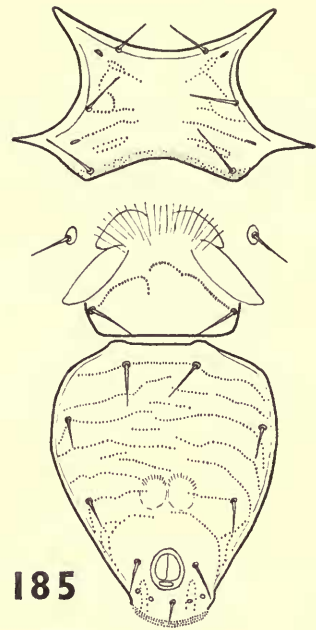
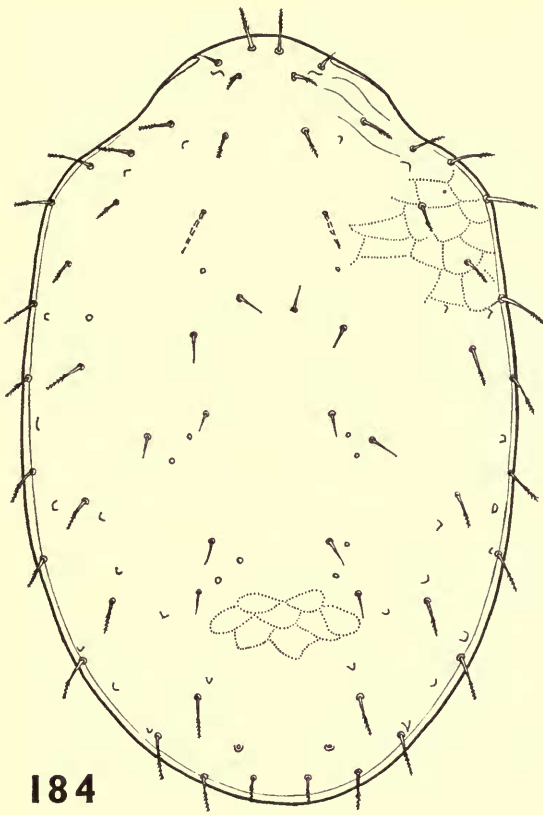
DISTRIBUTION. Berlese (1910) described specimens on *Copris bituberculatus* in Texas and *Copris carolina* in "America boreale". We have figured a single female on *Phanaeus lancifer* L., collected at Moraballi Creek, Essequibo River, British Guiana, by the Oxford University Expedition (1929-435).

Macrocheles pegazzanae sp. nov.

FEMALE. Dorsal shield ($952-1,235\mu$ long \times $591-785\mu$ wide) entirely covered by a very fine punctate reticulation and bearing 29 pairs of setae (Text-fig. 184). Setae



FIGS. 180-183. *Macrocheles hirsutissima* (Berlese), female. Fig. 180, dorsal shield. Fig. 181, ventral shields. Fig. 182, chelicera. Fig. 183, tarsus II.



FIGS. 184-187. *Macrocheles pegazzanae* sp. nov., female. Fig. 184, dorsal shield. Fig. 185, ventral shields. Fig. 186, chelicera. Fig. 187, tarsus II.

11, 14, 15, 22, 23, J2 and J3 simple, remaining setae pilose in their distal halves. Verticals, 11, separated by twice the diameter of their bases.

Sternal shield strongly granular. The structural lines are punctate and inconspicuous (Text-fig. 185). Genital shield broad, shallow, and truncate posteriorly. Ventri-anal shield (240–425 μ long \times 268–360 μ wide) ornamented with incomplete punctate lines and bearing nine simple setae.

The chelicera is shown in Text-fig. 186. The brush-like process of the synarthrodial membrane is short. Six rows of deutosternal teeth.

Genu IV with seven setae, all of which are strongly pilose distally. Tarsus II (Text-fig. 187) 260 μ , tibia II 185 μ .

MALE. Unknown.

LOCALITIES. The holotype female (1961.7.14.248) and one paratype (1961.7.14.249) on *Phanaeus bellicosus* Oliv. in the Nevinson collection (1918–14) from Sta. Catherina, Brazil; and one paratype (1961.7.14.250) on *Phanaeus dardanus* McLeay from the Moraballi Creek, Essequibo River, British Guiana, collected by the Oxford University Expedition (1929–485).

This species is named after Dr. F. Pegazzano.

Macrocheles spectandus Berlese, 1918

Macrocheles (Coprholaspis) spectandus Berlese, A., 1918, *Redia* 13: 151.

FEMALE. Dorsal shield (1,100–1,200 μ long \times 775–950 μ wide) pear-shaped, granular, and almost devoid of ornamentation, and bearing 28 pairs of setae (Text-fig. 188). Setae 14, 15, 22, 23, J2, J3 and J5 simple and short (minimum 27 μ). The remaining setae are long (maximum 160 μ), slender and sparsely pilose in their distal halves.

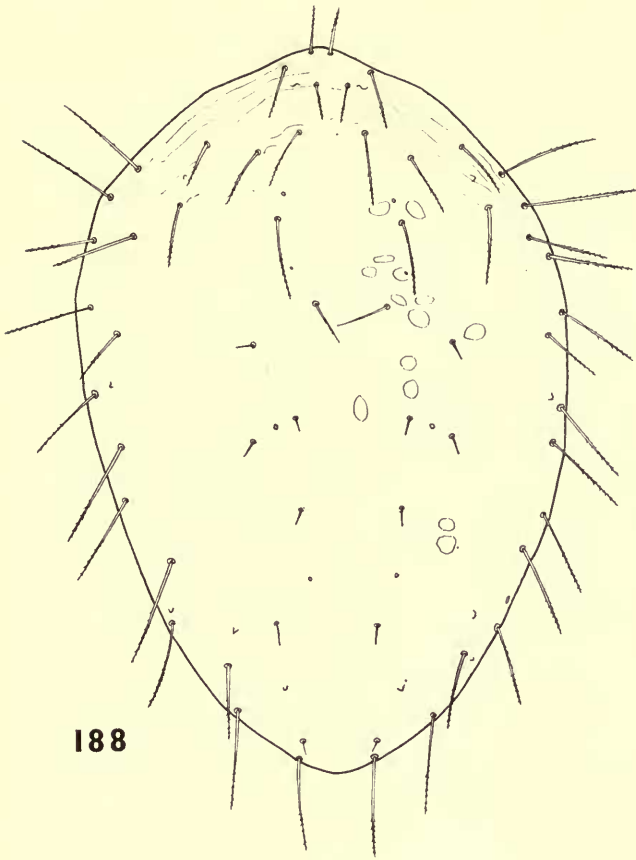
Sternal shield granular, narrow, without ornamentation, strongly concave on all four sides and bearing three pairs of setae which are pilose distally (Text-fig. 189). Genital shield granular, semicircular posteriorly, genital setae pilose distally. Ventri-anal shield (435 μ long \times 289 μ wide) granular, long and tapering, slightly concave laterally. The three anal setae are simple, and the six pre-anal are pilose distally. All setae on the interscutal membrane are pilose distally.

The chelicera is shown in Text-fig. 190. Brush-like process of the synarthrodial membrane less than half the length of the movable digit. Seven rows of deutosternal teeth, the middle three rows being close together. Tectum, Text-fig. 191.

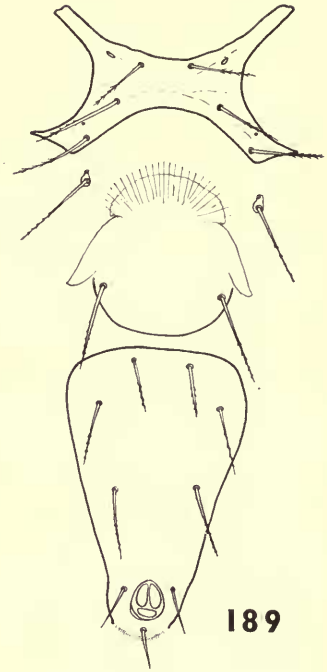
Genu IV with six stout setae, sparsely pilose in their distal two-thirds. Tarsus II with three distal spurs similar to those of *Pachylaelaps* and *Pachyseius* (PACHYLAE-LAPTIDAE).

MALE. Unknown.

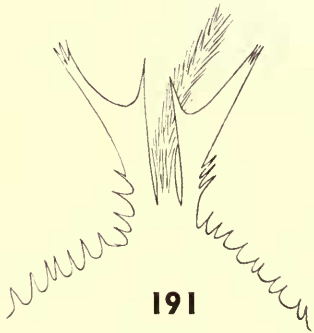
DISTRIBUTION. Berlese (1918) recorded this species from *Eudinopus dytiscoides* Schreib. at Alto Pencosa, San Louis, Argentina. The Museum collections contain nine females from *Eudinopus dytiscoides*, collected by G. E. Bryant (1919–147) at Villa Valeria, Argentina.



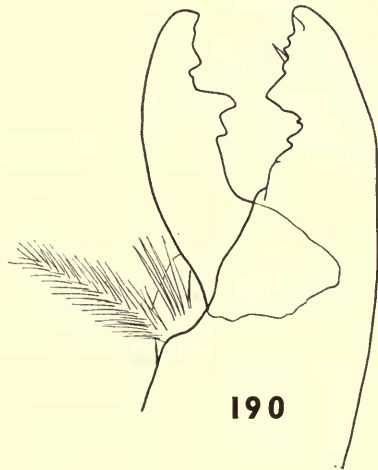
188



189



191



190

FIGS. 188-191. *Macrocheles spectandus* Berlese, female. Fig. 188, dorsal shield. Fig. 189, ventral shields. Fig. 190, chelicera. Fig. 191, tectum.

<i>Phanaeus sulcatus</i> Drury	<i>M. amygdaligera</i> Berl. (p. 378)
<i>Phanaeus telamon</i> Erichs.	<i>M. amygdaligera</i> Berl. (p. 378), <i>M. austro-americanus</i> sp. nov. (p. 389), <i>M. telamoni</i> sp. nov. (p. 372), <i>M. turki</i> sp. nov. (p. 386)
<i>Phanaeus wagneri</i> Har.	<i>M. bregetovae</i> sp. nov. (p. 392)
<i>Pinotus carolinus</i> L.	<i>M. filippinii</i> sp. nov. (p. 392), <i>M. bregetovae</i> sp. nov. (p. 392), <i>M. verticalis</i> sp. nov. (p. 378)
<i>Scarabaeus bonellii</i> McLeay	<i>M. rykei</i> sp. nov. (p. 369), <i>M. distanti</i> sp. nov. (p. 348)
<i>Scarabaeus brahminus</i> Cast.	<i>M. krantzi</i> sp. nov. (p. 351), <i>M. nevernalis</i> sp. nov. (p. 361)
<i>Scarabaeus carinatus</i> Gebler	<i>M. vernalis</i> (Berl.) (p. 375)
<i>Scarabaeus cristatus</i> Fabr.	<i>M. vernalis</i> (Berl.) (p. 375)
<i>Scarabaeus cuvieri</i> McLeay	<i>M. natalensis</i> sp. nov. (p. 358)
<i>Scarabaeus erichsoni</i> Harold	<i>M. ceylonicus</i> sp. nov. (p. 341), <i>M. krantzi</i> sp. nov. (p. 351)
<i>Scarabaeus gangeticus</i> Cast.	<i>M. vernalis</i> (Berl.) (p. 375), <i>M. thomasetti</i> sp. nov. (p. 372)
<i>Scarabaeus pius</i> Illig.	<i>M. vernalis</i> (Berl.) (p. 375)
<i>Scarabaeus prodigiosus</i> Er.	<i>M. abbreviatus</i> Berl. (p. 332)
<i>Scarabaeus puncticolis</i> Latr.	<i>M. pisentii</i> (Berl.) (p. 361), <i>M. vernalis</i> (Berl.) (p. 375)
<i>Scarabaeus sacer</i> L.	<i>M. pisentii</i> (Berl.) (p. 361), <i>M. vernalis</i> (Berl.) (p. 375)
<i>Scarabaeus semipunctatus</i> Fabr.	<i>M. pisentii</i> (Berl.) (p. 361), <i>M. vernalis</i> (Berl.) (p. 375)
<i>Scarabaeus socotranus</i> Gillet	<i>M. pisentii</i> (Berl.) (p. 361)
<i>Sceliages adamastor</i> Serv.	<i>M. marshalli</i> sp. nov. (p. 354)
<i>Sceliages augias</i> Gillet	<i>M. sternalis</i> sp. nov. (p. 369)
<i>Sebasteos galenus</i> Westw.	<i>M. rhodesi</i> sp. nov. (p. 365)
<i>Sebasteos laticeps</i> Péring	<i>M. rhodesi</i> sp. nov. (p. 365)

SUMMARY

The external morphology and classification of the insecticolous species of *Macrocheles* are discussed with particular reference to 46 species collected from coprid beetles in the Collections of the British Museum (Natural History). These species, of which 38 are considered new, are described and figured.

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